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FOREST SERVICE U.S. DEPARTMENT OF AGRICULTURE

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Soils and Vegetation of the **FRENCH GULCH QUADRANGLE** (24D-1,2,3,4) Trinity and Shasta Counties, California

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FOREWORD

Basic information about soils and vegetation—their characteristics, location, extent, and relationships—is especially useful to the land manager. It provides him with a foundation for understanding and managing the ecosystem—the ecological community that includes soils, vegetation, animals, and climate. And by applying an ecological approach, he can make more efficient and productive use of the land. He can apply management procedures that have proved successful in areas of known soils and vegetation to other areas with the same characteristics. With basic information on hand, the land manager lessens his chances of having an extension of these procedures turn out to be hit-or-miss propositions or—at worst—an outright failure.

Soil vegetation surveys are designed to produce useful maps and information. The data are useful to both the practitioner as well as the researcher. In land management research, prior knowledge of the ecosystem is mandatory if the work is to succeed. If the vegetation is to be changed, the information from such surveys might be used to estimate probable results.

The maps and the accompanying information in this report were prepared by the State Cooperative Soil-Vegetation Survey project of the Pacific Southwest Forest and Range Experiment Station, Forest Service. The project is financed through appropriations of the California Legislature to the Division of Forestry, Department of Conservation, Resources Agency of California. Cooperating organizations in the Soil-Vegetation Survey are the Division of Forestry; the Department of Agronomy and Range Science and Department of Soils and Plant Nutrition, University of California, Davis; School of Forestry and Conservation, University of California, Berkeley; and the Pacific Southwest Forest and Range Experiment Station at Berkeley. Project Leader is Wilmer L. Colwell, Jr., Pacific Southwest Forest and Range Experiment Station at Berkeley.

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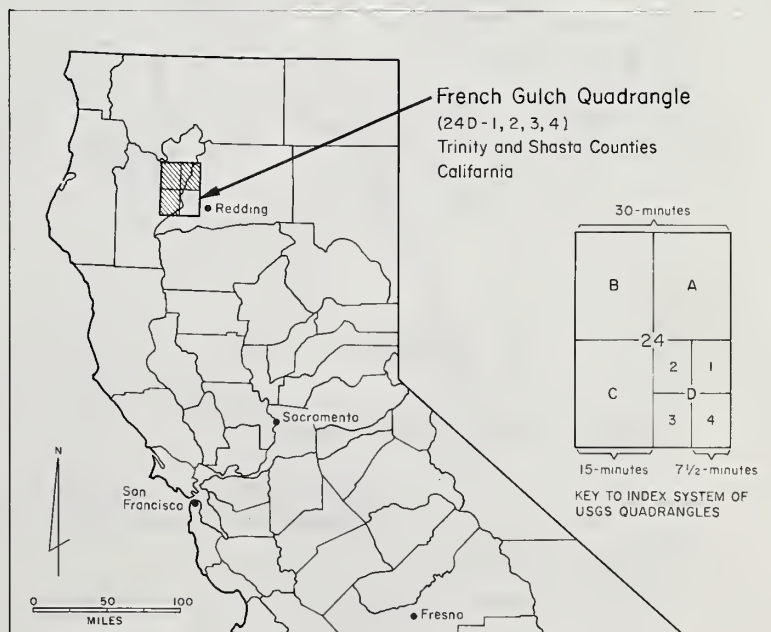
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The French Gulch Quadrangle (U.S. Geological Survey 1944) includes 145,000 acres of mountainous land, mostly forested with some chaparral and woodland grass, located between 7 and 25 miles west of Redding (*fig. 1*). Most of this acreage is in Shasta County with part of it in Trinity County in the Trinity range of the Klamath Mountains in northern California. The most prominent landmarks are Shasta Bally Mountain (6,209 feet elevation) and Whiskeytown Reservoir (*fig. 2*). State Highway 299, between Redding, Shasta County and Weaverville, Trinity County, crosses the quadrangle. Shasta County Highway A-16 crosses the southeast corner through the village of Igo between Redding and Pla-

tina. A main county road leads north from Highway 299 to the old mining town of French Gulch, which lies along Clear Creek in the north.

The land is used mostly for watershed, but timber production, outdoor recreation, and wildlife habitat are also important. Livestock grazing is dominant in the southeast, near and west of Igo. Mining for copper, zinc, gold, sulfur, and other ores was formerly important in the vicinity of French Gulch and is still an obvious, if not active, part of the area. Most of the land is privately owned. Public Land is administered by the U.S. Bureau of Land Management, U.S. National Park Service, and U.S. Forest Service.

Figure 1—The French Gulch Quadrangle lies about 7 miles west of Redding, California.



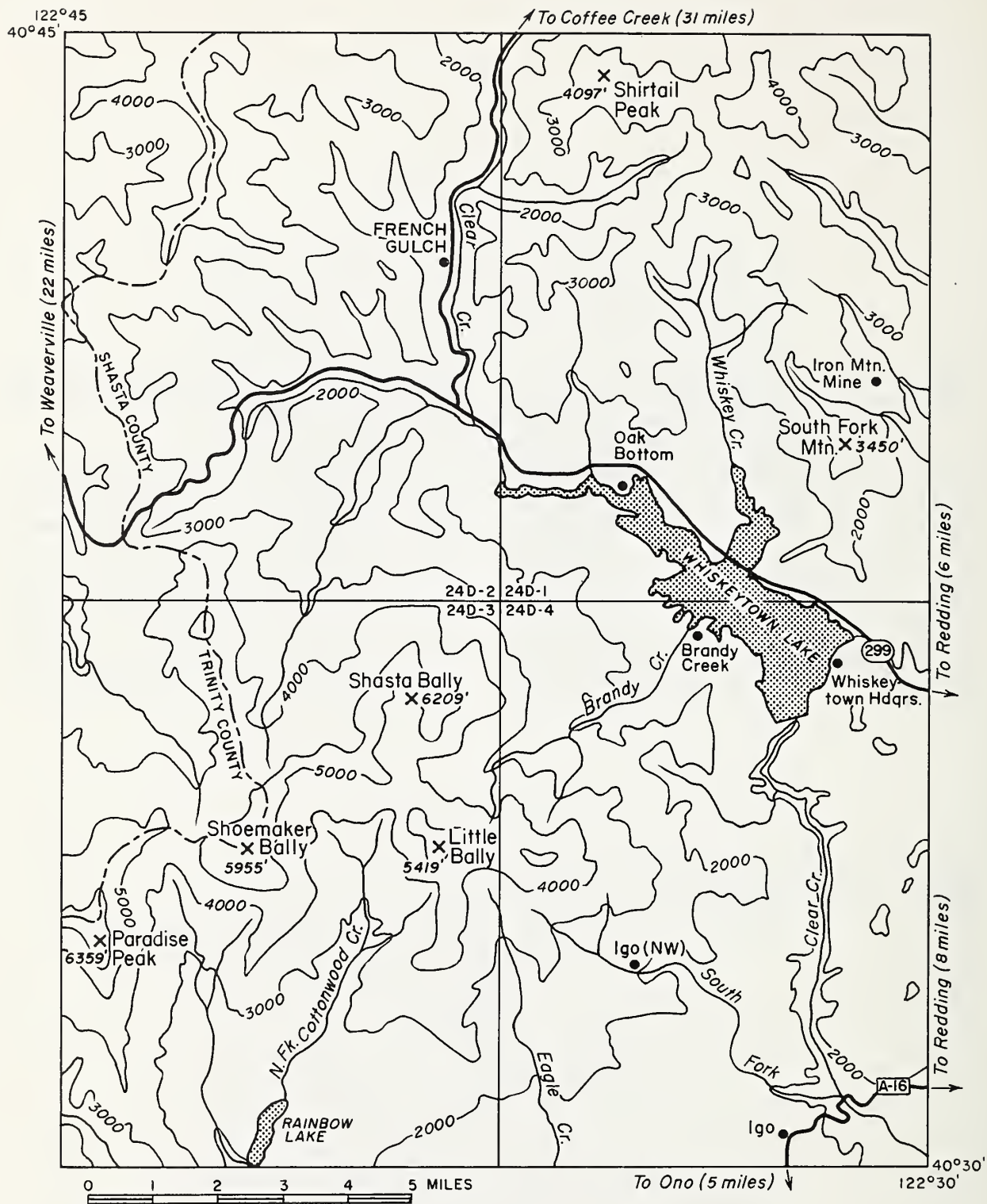


Figure 2—Topographic map of the French Gulch Quadrangle (U.S. Geological Survey 1964).

SURVEY AREA

Climate

The climate of the French Gulch area is hot and dry from late spring to mid-fall, when it turns cool with rain and snow falling intermittently. Below 2,000 feet elevation, snow seldom remains on the ground for more than 2 weeks; above 4,500 feet, a snowpack remains from December into April in most years. For example, on April 20, 1967, after a fairly normal winter, 8 feet of snow stood on the level ground and drifts were 20 feet deep at 6,200 feet elevation on Shasta Bally Mountain.¹

The average annual precipitation (*fig. 3*) ranges from about 38 inches near Igo to more than 80 inches near Iron Mountain Mine (California Department of Water Resources 1964). Limited data¹ indicate wide variability in rainfall in short distances. For example, 24.8 inches were measured at Brandy Creek on the south shore of Whiskeytown Lake in January 1969. Only 13.9 inches were measured at Oak Bottom 2.5 miles to the northwest on the north shore of the Lake, and only 12.9 inches were measured at the summit of Shasta Bally Mountain 4.5 miles to the west and about 5,000 feet higher. Wide variability from season to season was demonstrated at Brandy Creek gauge, where 93 inches were measured in the 1966-67 season, 54 inches in the 1967-68 season, and 79 inches in the 1968-69 season. At French Gulch, the amount of rain was 43 inches in 1966-67; 26 inches in 1967-68; and 51 inches in 1968-69.

The average annual temperatures in the area range from 42°F. on Shasta Bally Mountain to 60°F. at National Park Service offices on the east shore of Whiskeytown Lake and a few degrees higher near Igo and on south-facing slopes below 2,000 feet elevation. The frost-free season varies from about 140 days in the higher elevations to about 250 days at most locations below 2,000 feet elevation (U.S. Weather Bureau 1965).

Geology

The French Gulch Quadrangle lies entirely within the Klamath Mountains geologic province (Bailey 1966). The geology has been described in detail by Albers (1964); Albers, *et al.* (1964); and Kinkel, *et al.* (1956). The varied rock types in this quadrangle can be placed in 10 groups (*fig. 4*), seven of which are

geologic formations ranging in age from pre-silurian to recent:

Abrams Mica Schist: The oldest rocks exposed in the Quadrangle are the Abrams schists in the southwest corner. Quartz-mica schists of probably pre-silurian age are extensive in the Weaverville Quadrangle to the west. Along the east edge of the schists is an intermittently exposed belt of serpentine and peridotite about one-fourth mile wide.

Shasta Bally Batholith: The next major formation to the east is the granitic Shasta Bally Batholith, which occupies more than one-third of the Quadrangle. The batholith is surrounded by a shell of gneissic rocks produced by contact metamorphism of the surrounding rocks at the time the granitic material was intruded.

Copley Greenstone: The Copley Greenstone of probable Devonian age lies in the west and north. It consists of massive basic and intermediate volcanic

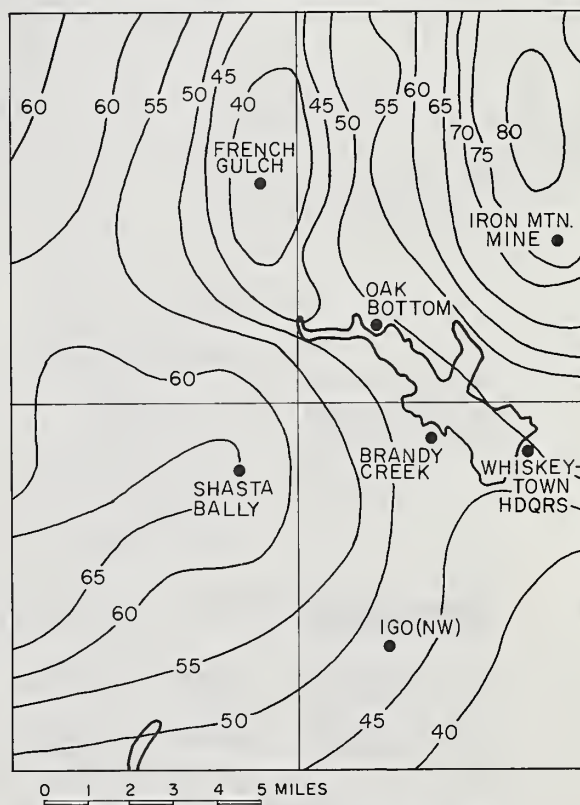


Figure 3—Isohyetal map shows distribution of equal mean seasonal precipitation (inches) in the French Gulch Quadrangle (California Department of Water Resources 1964). ● indicates rain gauge location.

¹Data on file at U.S. National Park Service offices at Whiskeytown, California.

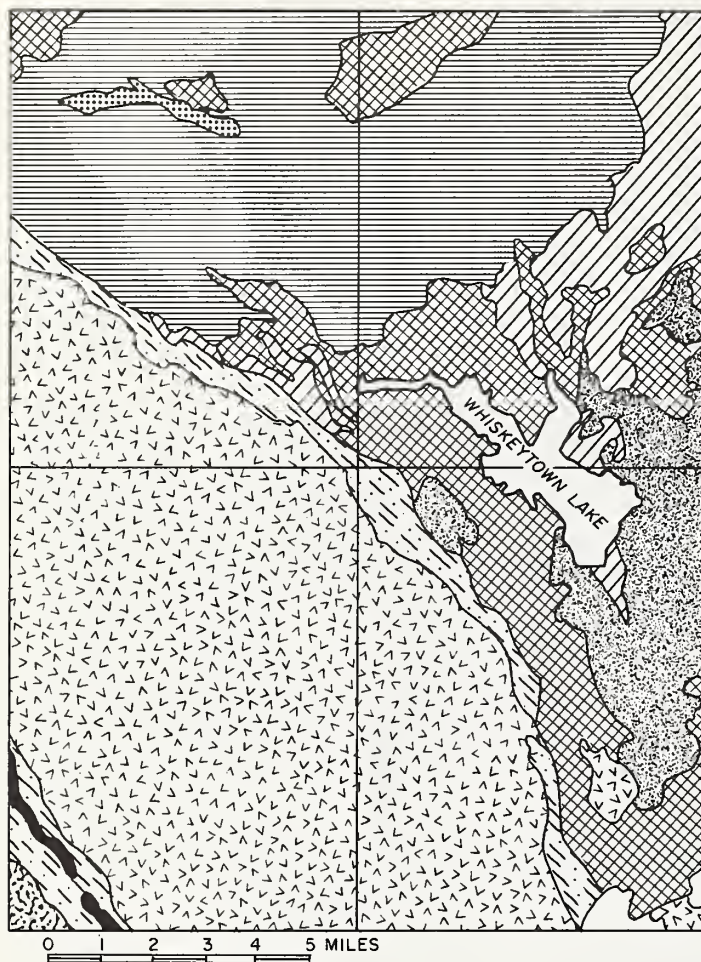
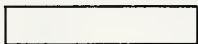

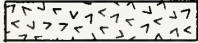
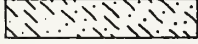



Figure 4—Geologic map shows rock types that are parent materials for the present soils. (Generalized from Albers, *et al.* 1964)

	<i>Rock Types</i>	<i>Formation</i>	<i>Epoch</i>
	Semi consolidated gravels	Red Bluff	Quaternary (Pleistocene)
	Birdseye porphyry	--	
	Quartz diorite and granodiorite	Shasta Bally Batholith	Jurassic or Cretaceous
	Gneiss and amphibolite	--	
	Peridotite and serpentine	--	
	Trondhjemite and albite granite	Mule Mountain Stock	Mississippian
	Shale and conglomerate	Bragdon	
	Meta-rhyolite	Balaklala Rhyolite	Devonian
	Meta-andesite	Copley Greenstone	
	Mica schist	Abrams Mica Schist	Pre-Silurian

rocks that have been hydrothermally altered to greenstone. Where the greenstone adjoins the Shasta Bally Batholith it has undergone contact metamorphism to gneiss and schist.

Balaklala Rhyolite: North and east of Whiskeytown Lake the Balaklala Rhyolite overlies the Copley Greenstone. In Devonian time it erupted on top of the Copley Greenstone with some interfingering. The Balaklala Rhyolite is light colored, massive to porphyritic, and is the host rock for the massive sulfide deposits which have been extensively mined, particularly for copper and sulfur (Kinkel, *et al.* 1956).

Bragdon Formation: The northern third of the Quadrangle west of the Balaklala Rhyolite is dominated by an extensive dark gray slaty shale and conglomerate, the Bragdon Formation, of Mississippian age. It overlies the Copley Greenstone. Where the Bragdon formation adjoins the Shasta Bally Batholith the shales have been metamorphosed to gneiss or schist. The Bragdon formation is widespread to the north and west of the Quadrangle.

Mule Mountain Stock: The only remaining formation of significant area is the Mule Mountain Stock. This body of light colored granitic rock lies along the east edge of the Quadrangle south of the Balaklala Rhyolite. It varies at short distances from less weatherable albite granite to more weatherable trondhjemite. The light colored albite granite is quite obvious in road cuts near the east end of Whiskeytown Lake. This stock appears to be partly an intrusion emplaced from below and partly a granitization of the Balaklala Rhyolite and possibly of the more felsic parts of the Copley Greenstone (Kinkel, *et al.* 1956).

Minor Features: Many dikes and sills of various kinds of igneous rocks occur. West of French Gulch is a swarm of diorite porphyry dikes and in other areas quartz porphyry, altogether known locally as "birds-eye porphyry," so called because the centers of the

feldspar phenocrysts commonly weather out, leaving a depression that somewhat resembles the pupil of an eye. In the southeast corner just east of Clear Creek and south of Placer Road (County Highway A-16) lies an area of less than 100 acres of cretaceous marine conglomerate. This conglomerate appears to be an extension of the Rector member of the Budden Canyon Formation described by Murphy, *et al.* (1964). Coarse, poorly-to-well-cemented gravels making up benches and terraces cover about 500 acres, mainly south and east of Igo but also along Clear Creek near Tower House about 2½ miles south of French Gulch. Albers (1965) correlated these gravels with the Pleistocene Red Bluff formation.

Physiography

Elevations range from about 625 feet along Clear Creek in the southeast corner of the Quadrangle to 6,359 feet at the summit of Paradise Peak (*fig. 2*). More than 80 percent of the area can be characterized as steep mountainous but with different general topographic forms for different geological formations. In the granitic areas, streams and ravines generally radiate away from the central ridge which extends from Paradise Peak to Shasta Bally. In the part of the Quadrangle dominated by the Bragdon shales and conglomerates, the pattern is a coarse herringbone type—particularly well seen between Trail Gulch and French Gulch. The metavolcanic portion of the Quadrangle has a similar but less well defined drainage pattern. The somewhat level areas include the pediment and dissected terraces in the southeast part of the Quadrangle near Igo, along Clear Creek below Whiskeytown Dam, and along Clear Creek upstream from Whiskeytown Lake. The upstream level area includes gold dredge tailings as well as dissected terraces and a minor amount of alluvial bottomland along streams.

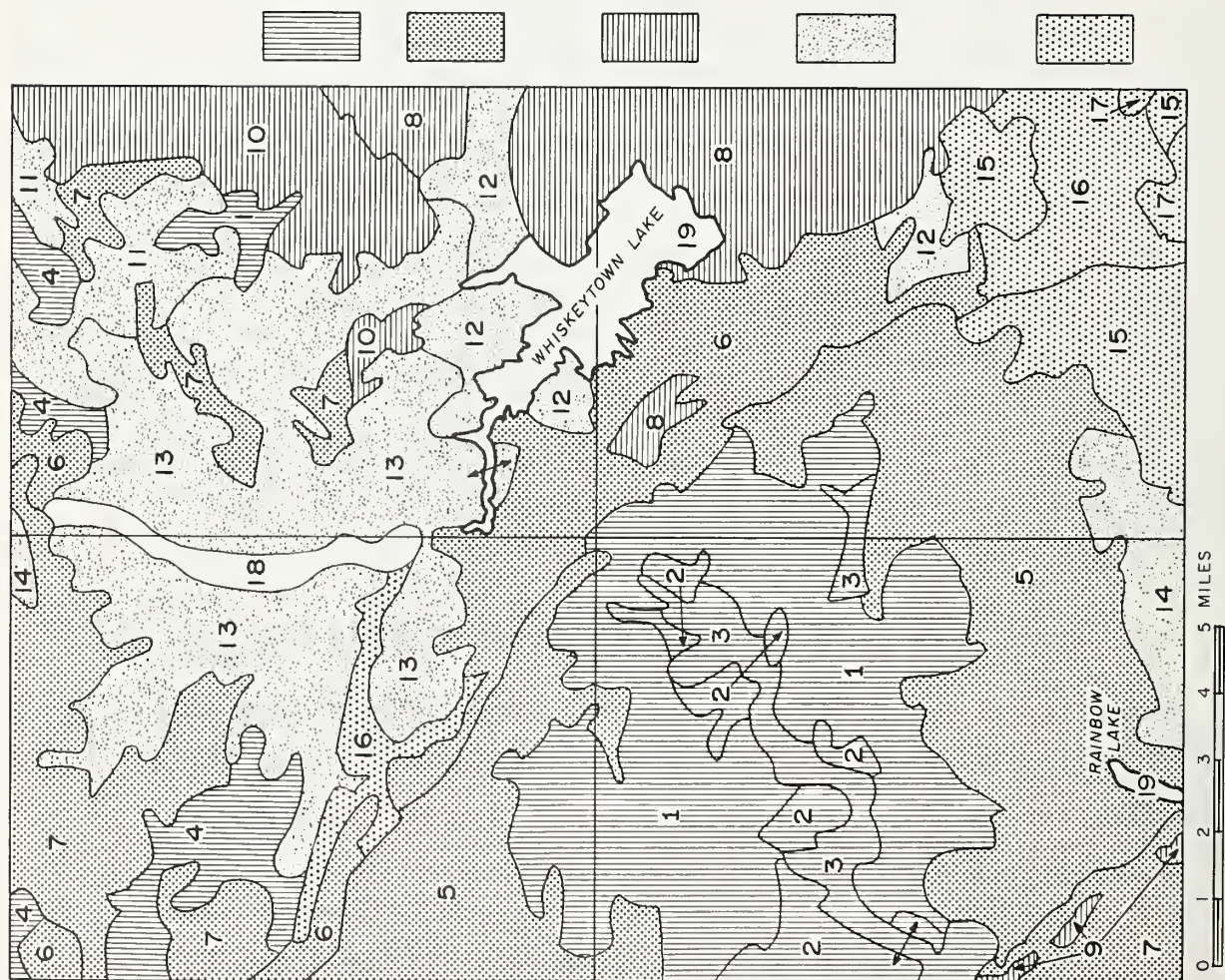
SOIL-VEGETATION ASSOCIATIONS

The many kinds of rocks, soils, and climate in this Quadrangle have resulted in a diverse and complex landscape. A total of 178 different phases of soils (disregarding slope) and 29 miscellaneous land types are mapped (*tables 1, 2*), along with over 100 species of woody plants (*table 3*) in different combinations of cover and composition (Soil-Vegetation Maps, 24D-1, -2, -3, and -4). Many of these soil-vegetation combinations occur in repeating patterns and can be

grouped into broad ecosystem-like units of soils and vegetation with similar characteristics and productivity.

To group the variable landscape elements in the French Gulch Quadrangle into simpler units, the area can be divided into three broad vegetation types: conifer forest, chaparral, and woodland-grass (*fig. 5*). The forest occupies about 65 percent of the area, chaparral (shrub) type occupies about 25 percent,

Figure 5—Soil-vegetation associations map provides identifying numbers for different combinations of soil types and vegetation types.



CONIFER FOREST TYPE

Shrub-conifer associations

1. Corbett / Shrub tanoak — mixed conifer
2. Corbett / True fir
3. Corbett / Ridge top chaparral
4. Colluvial and Rock land / Canyon live oak — Douglas-fir

Conifer-hardwoods associations

5. Chawanakee — Chaix — Holland / Ponderosa pine — Douglas-fir — California black oak
6. Neuns — Boomer / California black oak — canyon live oak — ponderosa pine
7. Shectiron — Marpa — Josephine / Ponderosa pine — Douglas-fir — California black oak

Conifer-hardwoods-shrub associations

8. Modesty / Manzanita — California black oak — ponderosa pine
9. Huse — Dubakella / Jeffrey pine — leather oak
10. Kidd — Behemotosh / Ponderosa pine — Douglas-fir — California black oak — manzanita

CHAPARRAL TYPE

Manzanita associations

11. Maymen — Colluvial land / Manzanita — shrub oak
12. Goulding — Kidd / Manzanita — toyon

Chamise-shrub oak-Ceanothus associations

13. Maymen — Goulding — Stonyford — Los Gatos / north aspect Brewer oak, south aspect chamise
14. Eroded Chawanakee — eroded Sierra / Chamise — Lemmon ceanothus

WOODLAND-GRASS TYPE

Oak-grass associations

15. Kanaka — Sierra / Interior live oak — blue oak — annuals
16. Auburn — Millsholm — San Andreas / Blue oak — annuals — digger pine

Shrub-grass-oak associations

17. Newtown — Redding — Newville / Manzanita — annuals — blue oak

ALTERED AREAS

18. Gold dredge tailings, residential areas, and mined Horseshoe soils
19. Reservoirs — Whiskeytown Lake and Rainbow Lake

while woodland-grass occupies about 6 percent. The remaining area includes about 2.5 percent in reservoirs—Whiskeytown and Rainbow Lakes—and 1.5 percent in developed areas, including gold dredge tailings, roads, and the town of French Gulch.

Each broad type is subdivided into groups of soil-vegetation associations which have some characteristics of the soils or vegetation or both in common. The grouping of one or more soil series for each association is based on soil development, broad behavior characteristics, and major rock types, i.e., granitic, metavolcanic, sedimentary, and ultrabasic rocks (Zinke and Colwell 1965). Plant species are grouped on the basis of stature, environmental requirements, and relationships.

Seventeen associations and two altered units are mapped in the Quadrangle (fig. 5). They consist of assemblages of species similar to some groups observed in the eastern Siskiyou Mountains, in the western Siskiyou (Waring 1969), in the interior valleys of southern Oregon (Franklin and Dyrness 1969), and on the north Coast Ranges, Sierra Nevada, and foothills of California (Munz and Keck 1959). These observations suggest that the vegetation of the French Gulch Quadrangle possesses elements from the north, south, east, and west not found together elsewhere.

Conifer Forest Type

Ten associations, falling into three groups, comprise the conifer forest vegetation type. Groupings are based on soils, vegetation composition, and site quality. These associations occur generally above 1,500 feet elevation and the 40-inch rainfall zone. Most of the associations can grow commercial timber (fig. 6), except the Corbett/ridgetop chaparral, and the Colluvial-Rock land/Canyon live oak—Douglas-fir associations.

The first of the three association groups consists of four associations occurring at the highest elevations in the area—mostly above 3,000 feet on the north-facing slopes and above 3,500 feet on the south-facing slopes. Only this part of this Quadrangle usually has snow cover from December into April. The dominant soil is the coarse loamy sand Corbett series, derived from granitic rocks, and having little, if any, development into horizons. Corbett soils are classified as Entisols. These highly erodible soils are the source of much of the sand which is causing problems in the Salmon spawning beds of the Trinity River near Lewiston (California Resources Agency 1970). The vegetation is mostly shrub mixed with a varying

percent cover of conifers of low site quality. One association in this group, mostly canyon live oak, grows on land so steep that the soil is dominantly unstable colluvial land.

The second association group has three soil-vegetation associations at middle elevations below the first group. The soils here are deeper, more developed, and redder than those in the first group, and have a greater clay content in the subsoils. Each association has a soil development sequence on three different parent materials. The first soil series in each association has soil horizons just beginning to develop and is classified in the order Inceptisols. These soils are older than the Entisols, but younger than the Alfisols. The other soils in the associations are generally Alfisols and are progressively more developed, with clay enriched B horizons that have medium base saturation. The soils in these two orders comprise most of the forest soils in the southeastern part of the Klamath Mountains geologic province. The associations in this group are generally the most productive for commercial conifers in the Quadrangle. The combination of ponderosa pine and California black oak occurs in all associations of the group. The presence of black oak is a reliable indicator of the capability of the soil to grow commercial ponderosa pine. Wieslander (1935) was one of the first to observe the close association of California black oak with commercial conifer timber sites, and used this relationship to show evidence of former pine forests from remnant black oak stands.

The third association group also has three soil-vegetation associations. Manzanita shrubs are part of the conifer-hardwood vegetation.

Shrub-Conifer Associations

Corbett/Shrub tanoak-mixed conifer: The sandy Corbett soils support an open cover of evergreen shrub species and conifers. The shrubs include shrub tanoak, canyon live oak, greenleaf manzanita, and an unusual form of squaw carpet. The conifers are dominantly ponderosa pine and sugar pine and of medium site quality. Douglas-fir, incense-cedar, and white fir are present but not as common as in the mixed conifer of the Sierra Nevada. Herbs and grasses usually cover 10 percent or less of the soil surface.

Corbett/True fir: Above about 5,000 feet elevation, white fir trees make up a larger part of the tree composition than at lower elevations. A few stands of red fir occupy north-facing slopes just below the summits of Paradise Peak, Shoemaker Bally, and Shasta Bally. Most stands are of medium site quality,



Figure 6—Generalized timber site quality map of the French Gulch Quadrangle.

a few are of low site. This association also contains shrub tanoak and non-sprouting pine manzanita, and much bush chinquapin.

Corbett/Ridgetop chaparral: Along the divide from Paradise Peak to Shasta Bally and Little Bally divide south of Brandy Creek, the Corbett soils are shallow and rocky and exposed to frequent strong winds. The association of evergreen shrubs here includes bush chinquapin, pine manzanita, greenleaf manzanita, huckleberry oak, and shrub tanoak. The few pines and firs growing in this unit are distorted by the strong winds. This association is mostly unsuitable for growing commercial timber stands economically.

Colluvial and Rock land/Canyon live oak–Douglas-fir: On steep slopes (generally over 70 percent) the soils in the forest are, in many places, loose enough so that they slide down slope at the slightest disturbance. In these areas the vegetation is dominated by either canyon live oak or Douglas-fir. In some places, the stand is a mixture of these two with California black oak and a number of shrub species as well. Most of these areas are unsuited for harvesting commercial timber crops.

Conifer-Hardwoods Associations

Chawanakee–Chaix–Holland/Ponderosa pine–Douglas-fir–California black oak: Most of the granitic southwestern third of the French Gulch Quadrangle has the shallow Chawanakee and moderately deep Chaix soils on the steep slopes. Owing to their coarse texture and lack of cohesiveness these soils are highly erodible. When eroded they continue to produce large volumes of sand with every storm because of the highly decomposed nature of the underlying granitic rock. On the more gently sloping areas—ridges, spurs, and benches—soils occur in a sequence of development—Hotaw, Holland, Musick, and Hoda soil series—with their reddish clay loam to reddish clay subsoils. This development is in striking contrast to the pale sandy loams and included loamy sands of the Chawanakee and Chaix series. These soils have a cover of California black oak, ponderosa pine, Douglas-fir, and canyon live oak, with a lower shrub layer of deer brush, greenleaf manzanita, whiteleaf manzanita, and poison oak. Site quality for commercial conifers is generally medium. Some grassy areas are found on the Hotaw, Holland, Musick, and Hoda soils. In the canyons are many bigleaf maples and some tanoaks and madrones, particularly in Rich Gulch, Salt Gulch, and the headwaters of Paige Boulder Creek between 2,000 and 3,000 feet elevation. These canyon units

closely resemble the Mixed Evergreen Forest (Munz and Keck 1959; Franklin and Dyrness 1969) except for a few species.

Neuns–Boomer/California black oak–canyon live oak–ponderosa pine: Neuns soils (Inceptisols) and Boomer soils (Alfisols) are formed on greenstone or other metamorphosed basic igneous rocks. Neuns soils are generally on the steeper slopes and have gravelly loam, yellowish brown subsoils, while Boomer soils are on benches and less steep slopes and have clay loam reddish brown subsoils. The vegetation is dominated by California black oak, canyon live oak, ponderosa pine, and Douglas-fir with much whiteleaf manzanita and toyon in openings and poison oak in the understory. The Neuns soils have more canyon live oaks than do the Boomer, although California black oak is the most abundant tree on both soils. Site quality ranges from low to medium (mostly site class 3). Shallow, gravelly soils and steep slopes, along with being the lowest association in this subtype (mostly less than 2,000 feet), contribute to lower productivity for commercial conifers. Minor amounts of sugar pine, knobcone pine, incense-cedar, and Lemmon ceanothus occur in the drier, warmer parts of the association. Bigleaf maple, tanoak, and pacific dogwood occur in more moist canyons and on north-facing slopes in addition to the prevailing tree species. This association is part of Munz and Keck's (1959) Yellow Pine Forest and more specifically part of Waring's (1969) Black Oak Vegetation Type.

Sheetiron–Marpa–Josephine/Ponderosa pine–Douglas-fir–California black oak: The forest soils derived from sedimentary and metasedimentary parent materials are dominated by the Inceptisol, Sheetiron, and the Alfisols, Marpa and Josephine. In developmental sequence, Sheetiron soils have pale brown gravelly loam textures throughout, while Marpa soils have light brown gravelly clay loam B horizons, and Josephine soils have reddish brown clay loam B horizons. On some of the less steep slopes on older land surfaces, soils with red clay B horizons have developed. These soils are in the Sites series and classified as Ultisols. They are the most developed and are considered the end member of a soil developmental sequence. The vegetation is usually dominated by Douglas-fir and ponderosa pine. California black oak and canyon live oak make up most of the remainder with occasional sugar pine, incense-cedar and white fir trees. The more moist sites often have bigleaf maple, California hazel nut, shrub tanoak, and pacific dogwood in abundance. On many north-facing slopes and some northern ridgetops, shrub California black oak dominates the vegetation. This is one of the few

places where extensive growth of shrub California black oak is known (McDonald 1969). Medium to low site quality characterizes this association, while on the deeper Josephine soils in the southwest corner of the Quadrangle medium sites predominate.

Conifer-Hardwoods-Shrub Associations

Modesty/Manzanita—California black oak—ponderosa pine: Along the east side of Whiskeytown Lake and Clear Creek from the northerly South Fork Mountain to Mule Mountain the dominant soils are the light brownish gray and very pale yellow Inceptisols of the Modesty series. These gravelly coarse sandy loams are formed from the granitic Mule Mountain Stock. The Chawanakee and Chaix soils west of Clear Creek are similar but are cooler and have more deeply weathered parent rock. The Kanaka soils to the south and east are similar, but have heavy loam subsoils, are more gently sloping, somewhat warmer, and support woodland-grass vegetation rather than forest. Included within the Modesty association are many small areas of Diamond Springs soils—Ultisols with very strongly acid reddish clay loam B horizons. These have similar vegetation, but are found at lower elevations and have gently sloping topography in contrast to the steep land common to most Modesty soils. The vegetation of this association consists of California black oak, canyon live oak, whiteleaf manzanita, poison oak, and Lemmon ceanothus with scattered ponderosa and sugar pines. On south-facing slopes whiteleaf manzanita dominates, but toyon, scattered Digger pine, some stands of knobcone pine, and a few ponderosa and sugar pines are present. Here site quality is low. The Modesty association is somewhat unusual in having ponderosa and sugar pines growing where the mean annual temperature is above 59°F. On gentle slopes and north aspects site quality is medium with mostly site class 3. The northern part of this association was subjected to sulfur dioxide smelter fumes from 1896 to 1906 (Kraebel 1955). The fumes destroyed most of the vegetation and very likely contributed to the strongly acid nature of the subsoils on the more gentle slopes. The vegetation is still recovering.

Huse—Dubakella/Jeffrey pine—leather oak: This distinctly different association—covering only a few hundred acres—is found on a narrow and interrupted belt of ultra-basic rocks across the southwest corner of the Quadrangle. The soils include the shallow rocky Inceptisols of the Huse series, the somewhat deeper Alfisols of the Dubakella series from the serpentinized part of the ultra-basic rock, and some col-

luvial land with a significant amount of ultra-basic soil material included. The vegetation consists of an open stand of Jeffrey pine and incense cedar with numerous leather oak bushes. A small amount of sugar pine and wedgeleaf ceanothus is also present as is a sparse bunchgrass ground cover. Leather oak is known to grow only on soils derived from ultra-basic rocks. Most soils from these parent materials support Jeffrey pine stands rather than ponderosa pine. Site quality ranges from unsuited to low and medium.

Kidd—Behemotosh/Ponderosa pine—Douglas-fir—California black oak—manzanita: Behemotosh and Kidd soils, Alfisols and Entisols, respectively, are formed on the Balaklala Rhyolite mainly in the north eastern part of the Quadrangle north of the northerly South Fork Mountain. The Behemotosh soils are gravelly loams over cobbly clay loams about 2 feet deep generally on ridges and steep slopes. On gentler slopes a deeper, non-gravelly, non-cobbly variant occurs. These soils have vegetation dominated by ponderosa pine, Douglas-fir, sugar pine, and California black oak. Site quality is mostly low, with some areas in the low-medium class. The many small openings in the tree canopy contain several species of manzanita, shrub tanoak, and sierra gooseberry. Below 2,500 feet elevation, the only manzanita species is whiteleaf manzanita. Above 3,000 feet, whiteleaf manzanita is absent. The only manzanitas present are greenleaf manzanita and a new hybrid which we are calling Balaklala manzanita. The new hybrid was discovered in 1968 by James I. Mallory.

Chaparral Type

Chaparral, a dense thicket of stiff or thorny shrubs or dwarf trees (Sampson and Jespersen 1963), is well known in California and other areas that have a hot, dry season and a cool, wet season. These many kinds of shrubs—chamise, manzanitas, shrub oaks, and shrub forms of some tree species—grow on steep, rocky, slopes of shallow and colluvial soils that will not support tree vegetation. In some areas, near the margins of chaparral types, shrubs will encroach rapidly on the deeper, better soils that have been logged over or periodically burned and where accelerated erosion has begun.

The chaparral type in the French Gulch Quadrangle is divided into two association groups with two soil-vegetation associations (Nos. 11 through 14) in each. The associations are based on the soil properties, dominant vegetation, and slope aspect.

Manzanita Associations

Maymen–Colluvial land/Manzanita–shrub oak:

Maymen soils, gravelly loam Inceptisols, are found on the steep slopes and ridges of sedimentary rocks in close association with unstable very gravelly Entisols (unclassified as to series) on the adjacent colluvial land. The vegetation consists of a dense shrub cover on the Maymen soils and a more open shrub cover on the colluvial land. Greenleaf manzanita and shrub California black oak (McDonald 1969) dominate the vegetation in this association (as well as in part of the Sheetiron–Marpa–Josephine/Ponderosa pine–Douglas-fir–California black oak association). In parts of this association, Balaklala manzanita, Fremont silk tassel, shrub tanoak, knobcone pine, and canyon live oak are dominant. Herbaceous cover is practically nonexistent.

Goulding–Kidd/Manzanita–toyon: Below 2,000 feet elevation on the south-facing slopes near the Whiskey Creek arm of Whiskeytown Lake are shallow soils formed on metavolcanic rocks. These are the Goulding series and Kidd series (Inceptisols), formed from greenstone and meta-rhyolite. The vegetation is an open to semidense stand of shrubs—mostly whiteleaf manzanita and toyon. In places Brewer oak, shrub interior live oak, buck brush, knobcone pine, and canyon live oak are prominent.

Chamise-Shrub Oak-Ceanothus Associations

Maymen–Goulding–Stonyford–Los Gatos/north aspect Brewer oak:

This most extensive of the chaparral associations occupies the north-facing slopes in an area about 7 miles in diameter centered on the town of French Gulch. The Maymen and Goulding soils are Inceptisols formed on sedimentary and metavolcanic rocks respectively. Stonyford soils are shallow Alfisols with reddish brown gravelly clay loam subsoils in contrast to the yellowish brown gravelly loam subsoils of Maymen and Goulding. Los Gatos soils are similar to Stonyford soils but have dark brown surface horizons thicker than 10 inches (which places them among the Mollisols) and are formed from sedimentary rock. The vegetation is dominated by Brewer oak, shrub interior live oak, western mountain mahogany, and California black oak. Intertwined among these shrubs is poison oak, chaparral honeysuckle, and pipestem clematis. The understory consists of several species of annual and perennial grasses and forbs providing sparse ground cover (see plot 14, Quadrangle 24D-1, *table 4* and *table 5* for detailed information). At higher elevations the Maymen–

colluvial land/Manzanita–shrub oak and the forest associations containing Marpa or Neuns soils are found in similar slope positions.

Maymen–Goulding–Stonyford–Los Gatos/south aspect chamise: Just over the ridges on the south-facing slopes, on the same kinds of soils but shallower and more eroded than in the association described above, the cover is an almost impenetrable brushfield of chamise with some associated buckbrush, whiteleaf manzanita, and toyon. Herbaceous vegetation is sparse (plots 1-3, Quadrangle 24D-1, *table 4* and *5*). Extensive areas of chamise, the most typical and widely known of the California chaparral types, are found from here south to Baja California. Chamise is found in a few small patches further north, but the very northernmost known natural growth is only 21 miles northeast of French Gulch, near Delta Point in the Sacramento River canyon (U.S. Forest Service 1939).

Eroded Chawanakee–eroded Sierra/Chamise–Lemmon ceanothus: Between Rainbow Lake and Eagle Creek, along the south edge of the Quadrangle is a steep, brush covered, eroded area with a rather unique bench or step topography. The vegetation is a semidense stand of chamise, manzanitas, and Lemmon ceanothus with widely scattered ponderosa pine and California black oak. Chawanakee and Chaix soils from the forest zone and Sierra soils from the woodland grass zone are intermingled in a unit differing from either of the normally associated vegetation types.

Woodland-Grass Type

The Woodland-Grass, or Foothill-Woodland of Munz and Keck (1959), is an extensive zone in California completely encircling the central valley and covering much of the coast ranges and parts of southern California.

The Woodland-Grass area of the Quadrangle consists of about 9,000 acres of gently sloping to steep rangeland centered on Igo in the southeast corner and about 1,000 acres on very steep south-facing slopes along Highway 299 from the French Gulch junction to Trail Gulch and up Trail Gulch 2½ miles. Three soil-vegetation associations are recognized that differ in soil characteristics, vegetation, and forage production. A few areas within or adjacent to the Woodland-Grass type have been so altered by human activity that they are best considered just as “altered areas” rather than soil-vegetation associations.

Oak—Grass Associations

Kanaka—Sierra/Interior live oak-blue oak—annuals: On the granitic pediment at the southeast end of the Shasta Bally batholith and the lower parts and south-facing slopes of the Mule Mountain stock three soil series with intergrading characteristics and contrasting profiles occur. These soils are highly erodible. Therefore, they need more careful management than nearby non-granitic soils to prevent soil loss and gullyng. The Inceptisols are represented by the Kanaka series, brown sandy loams with very pale brown heavy loam or sandy loam subsoils grading into weathered granitic rock at 2 feet or more. The Alfisols include the Auberry series, similar to Kanaka but with brown sandy clay loam subsoils, and the more extensive Sierra series with their yellowish red sandy clay loam subsoils. The three soils represent a development sequence. Open to dense stands of interior live oak with scattered blue oak, Digger pine, valley oak, and a ground cover of annual grasses and forbs make up most of the vegetation. Estimated suitability for extensive range use would be medium except for the badly eroded areas which are unsuited for grazing (plot 1, Quadrangle 24D-4, *table 4*). A few small groups of ponderosa pines occur on the deeper soils.

Auburn—Millsholm—San Andreas/Blue oak—annuals—Digger pine: The three dominant soils in this association are formed from different parent materials, Auburn from greenstone, Millsholm from shale, and San Andreas from schist. The Auburn soils are reddish silt loam Inceptisols with hard bedrock between 1 and 2 feet down. Associated with the Auburn are small areas of Exchequer soils, similar but less than 1 foot deep, and Sobrante soils with clay loam B horizons and up to 40 inches deep to weathered greenstone or schist. Millsholm soils are brown silt loam Inceptisols with platy shale or slate at 10 to 20 inches. San Andreas soils have thick dark brown surface horizons (making them Mollisols) and fine sandy loam textures with schist bedrock at 20 to 40 inches. Depth to this bedrock is variable in short distances as the schist consists of vertical plates less than an inch thick of variable weatherability. This belt of schist lies along the east side of the Shasta Bally granitic mass. Vegetation in this association is an open to dense stand of blue oak, Digger pine, annual grasses and forbs, with varying amounts of shrubs from adjacent chaparral areas. Plot 5, Quadrangle 24D-2, in *tables 4 and 5*, represents this association but with somewhat less herbaceous matter and more brush than typical. For forage production, this association would be rated medium to low.

Shrub-Grass-Oak Associations

Newtown—Redding—Newville/Manzanita—annuals—blue oak: Newtown and Newville soils have gravelly loam A horizons with clay B horizons starting at 10 to 20 inches, which grade into the weakly consolidated gravelly sediments of the Pleistocene Red Bluff formation. Newville soils differ from the Newtown soils in having darker surfaces, a more abrupt boundary between the A horizons and the B horizons, and in having greater percentage of clay in the B horizon. They were not separated on the map because of their close similarity. The Redding soils occur on the level tops of some of the terraces formed by the Red Bluff formation. In part of the area they have hummocky microrelief with mounds about 10 to 20 feet apart and a difference in elevation of 6 to 10 inches between the mounds and the level above which they rise. The most important characteristic of the Redding soils is the impenetrable iron-silica cemented hardpan which lies about 20 inches below the surface. The vegetation in this association consists of patches of whiteleaf manzanita, sparse cover of annual grasses and forbs, and scattered blue oaks. The cover is more open on the Redding soils than on the others in this association. Suitability for extensive range use is low. Powell (1965) found that Redding soils responded to nitrogen and phosphorous when added together but there was no response when added singly, and no response to added sulfur.

Other Associations: In this Quadrangle, several other shrub-grass-oak associations occur but are too small in size to include within the broader groupings of the soil-vegetation associations. However, these smaller units may occur extensively in other Quadrangles.

Altered Areas

Gold dredge tailings, residential areas, and mined Horseshoe soils: The valley and terrace land along Clear Creek has been disturbed by mining activities producing ridges of cobbly dredger tailings and vertical red cliffs in the remnants of the dissected Horseshoe soils. Much of the tailings area has been leveled and is being used for building and mobile home sites.

Reservoirs—Whiskeytown Lake and Rainbow Lake: Whiskeytown Lake covers over 3,000 acres in the east central part of the Quadrangle. The reservoir covered the site of a stand of MacNab Cypress and is reputed to be the discovery site of this species. This particular stand was the only well publicized and easily accessible grove (Griffin and Stone 1967). At least one MacNab Cypress tree from the Whiskeytown grove remains, where it was transplanted, northeast of

the Whiskey Creek arm of Whiskeytown Lake in Section 9, Township 32 North, Range 6 West, M. D. M. Most of the Whiskeytown Reservoir area was occupied by the Goulding-Kidd/Manzanita-toyon association, with additional stands of the MacNab Cypress

and Knobcone pine.

Rainbow Lake, a reservoir of about 100 acres, in the southwest corner of the Quadrangle, appears to be filling with sand from the granitic soils in its watershed of about 8,000 acres.

TIMBER SITE QUALITY

In the French Gulch Quadrangle, more than 71 percent (100,000 acres) of the land is suitable for growing commercial conifers (*fig. 6*). The area has adequate rainfall, usually 40 inches or more, but the relative capacity of the land to grow timber as measured by site class will depend on such additional factors as soil depth, texture, stoniness, slope, aspect, and elevation.

The highest site (site class 5) occupies less than 1 percent of the commercial timber area. It occurs on the deep soils of less steep slopes, in draws, and on north-facing slopes. Of the medium sites, site class 4 occupies more than 30 percent of the commercial timber area. Located between 2,000 and 4,000 feet elevation, this site is characterized by the medium-

textured soils of the conifer-hardwoods associations. The largest portion (59 percent) of the timber area is site class 3. Less deep, coarse-textured soils, south aspect and steep slopes are characteristics of this site. Many areas are transitional zones to the chaparral and woodland-grass types.

The balance of the commercial timber area—about 10 percent—is site class 2. This site reflects the adverse climatic conditions on high ridge tops that have erodible, shallow, sandy soils, and the hot, dry areas adjacent to chaparral types of southern exposure at lower elevations. Most all areas of site class 2 and 3 have shrubs associated with the conifer-hardwood vegetation.

NEW SOILS AND PLANTS

In the investigation of the French Gulch Quadrangle, we discovered a number of new soils, and new or little-known shrubs. The new soils include a new series and three variants. The new shrub is a gray leaved, non-sprouting manzanita and the little-known shrubs include two other manzanitas, and a variety of squaw carpet.

New Soils

Modesty Series

The Modesty soil series (*tables 1, 2*) shown as map symbol 721 on the soil-vegetation maps is a distinctive new soil series described for this Quadrangle. Because it has not yet been correlated by the National Cooperative Soil Survey, a formal description of this group of soils is not available.

The soils of the Modesty series are classified in the coarse-loamy, mixed, thermic family of Typic Xerochrepts (Soil Survey Staff 1970). They are well to excessively drained, moderately coarse textured upland soils developed from weathered granitic rock. They occur on steep to very steep slopes, under mixed stands of shrubs, hardwoods, and conifers at

elevations of 800 to 3,000 feet in the foothills of the Klamath Mountains and Sierra Nevada of northern California. Annual precipitation ranges from 40 to 70 inches. Mean annual temperature is about 60°F., average January temperature is 44°F., and average July temperature is about 79°F. Frost-free period is 180 to 240 days.

These soils are shallow to moderately deep and have light gray, strongly acid, gravelly sandy loam surface horizons and nearly white to light yellowish brown, strongly acid loam subsoils.

Commonly associated with the Modesty soils are other timber soils of the Chawanakee, Behemotosh, Diamond Springs, Neuns, and Boomer series and the woodland-grass shrub soils of the Kanaka, Kidd, Goulding, and Auburn series.

A representative soil profile on a 49 percent west-facing slope under a semidense stand of whiteleaf manzanita, toyon, California black and canyon live oaks, elevation 2,200 feet (1 mile south of South Fork Mountain Lookout in the southeast one-fourth of Section 10, T. 32N., R. 6W.) is described as follows:

01—1 to 0 inch, scattered litter of shrubs and oaks, with some erosion pavement of gravels and a few small cobbles.

A1—0 to 3 inches, light brownish gray (2.5Y 6/2) gravelly sandy loam, dark grayish brown (2.5Y 4/2) moist; weak fine and medium subangular blocky to granular structure; slightly hard, friable, slightly sticky and slightly plastic; abundant very fine roots; few very fine tubular and many very fine interstitial pores; strongly acid (pH 5.5); gradual smooth boundary; 1 to 6 inches thick.

A3—3 to 6 inches, light gray (2.5Y 7/2) sandy loam, pale brown (10YR 6/3) moist; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky to slightly plastic; few very fine, fine and medium roots; many very fine and fine interstitial and few very fine tubular pores; strongly acid (pH 5); gradual smooth boundary; 2 to 8 inches thick.

B2—6 to 20 inches, white (2.5Y 8/3) loam, light yellowish brown (10YR 6/4) moist; massive; slightly hard, firm to friable, slightly sticky to slightly plastic; few very fine, fine and medium roots; many very fine and fine interstitial and few very fine tubular pores; strongly acid (pH 5.5); abrupt irregular boundary; 10 to 25 inches thick.

C—20 to 40 inches, soft weathered albite granite, with few very fine roots and few thin clay bridges; strongly acid (pH 5.5); grades into hard albite granite at about 40 inches.

Colors range from gray to very pale brown in the 10YR and 2.5Y hues on the surface and from white to pale yellow and very pale brown in the 2.5Y and 10YR hues in the subsoil. Textures range from gravelly very coarse sandy loam to sandy loam in the surface, and from gravelly loam to coarse sandy loam in the subsoil. The soil reaction usually changes little with depth, but may range from slightly acid to strongly acid in the profile. Depth to weathered rock is variable in short distances, but normally ranges from 12 to 30 inches. Hard granitic rock may be found at depths from 30 inches to more than 30 feet.

Modesty gravelly sandy loam is usually excessively drained. Surface infiltration is rapid and the permeability is moderately rapid to rapid. Runoff is slow to moderate. Under dense vegetative cover and gentle slopes, erosion is slight to moderate. But on steep slopes that have heavy removal of vegetation either from fire or logging, the erosion hazard is high to very high. Available water-holding capacity is low to medium. Fertility is low.

The Modesty soils are of low to medium site quality for timber production. Because of the predominance of shrub and hardwood vegetation cover, the

main use is for watershed and wildlife habitat.

Tish Tang Variant 2

The Tish Tang Variant 2 soils differ from the typical Tish Tang soils primarily in being shallower (20 to 40 inches to bedrock rather than 72 to 120 or more). They differ from the Tish Tang Variant soils of the Hoopa Quadrangle (DeLapp and Skolmen 1961) in having the normal pale brown subsoils rather than mottled subsoils. The Tish Tang Variant 2 soils have a varying amount of shale fragments in the surface few inches derived from the adjacent Bragdon formation and some diorite porphyry fine gravels near the bedrock.

Behemotosh Variant

Behemotosh Variant soils differ from typical Behemotosh soils in having clay loam textures rather than very gravelly or cobbly clay loams, and very strongly acid subsoils rather than moderately acid subsoils. They are usually found on gently sloping plateau-like areas above 3,000 feet in areas where rhyolite is the bedrock.

Fiddletown Variant

Fiddletown Variant soils differ from Fiddletown soils in having clay loam subsoils rather than stony or gravelly loams as found in typical Fiddletown soils.

New and Little-Known Shrubs

Balaklala Manzanita

The new hybrid *Arctostaphylos canescens* \times *viscida*, which we are calling Balaklala manzanita, is found in this Quadrangle (table 3). This shrub resembles *A. canescens* Eastwood, but is generally smaller (1 to 5 feet tall) and has bracts of the inflorescence distinctly shorter than the flower pedicels, a key character among manzanitas. Balaklala manzanita grows on the highland between Clear Creek and the Sacramento River above 2,500 feet in openings in the forest and in the upper part of the chaparral associations. Gankin² reports having found it on Red Mountain in Mendocino County, California.

Other Manzanitas

Eight species and subspecies of manzanita were noted in the French Gulch Quadrangle. Two others

²Personal communication with Roman Gankin, formerly with University of California Arboretum, Davis, May 2, 1973.

have recently come to the attention of botanists. One individual of Roof manzanita, *A. Roofii* Gankin, was found on the Trinity divide within 200 yards south of Buckhorn summit and several shrubs that appear to be Shingletown manzanita, *A. manzanita* ssp. *Wieslanderi* Philip V. Wells, were seen along the ridge road west of Iron Mountain.

Trinity Squaw Carpet

Trinity squaw carpet (*Ceanothus prostratus* Benth. var. *laxus* Jeps.) is an open, somewhat upright, form of the dense, prostrate *Ceanothus prostratus* Benth. It is distinctive in the shrub landscape of the Corbett/shrub tanoak-mixed conifer association. This variety

was previously known only from Hot Springs Valley near Mount Lassen 70 miles to the east (Jepson 1925), from a few places on the Sierra Nevada (McMinn 1942), and from the headwaters of New River 40 miles to the northwest.³ Although McMinn (1942) recognized the variety, his description says nothing about the open, upright, habit which Jepson apparently used to distinguish the variety. McMinn's concentration on fruit and leaf characters, which aren't greatly distinguishing in this case, may be the reason that Munz and Keck (1959) reduced the variety to synonymy under *C. prostratus*. Trinity squaw carpet is mapped on about 2,000 acres on Buckhorn Mountain and Shoemaker Bally (table 3).

LEGEND TO THE MAPS

Base Maps

Base maps used for the Soil-Vegetation maps are specially prepared by the Pacific Southwest Forest and Range Experiment Station, mostly from published sources. Each Soil-Vegetation map consists of a standard 7½-minute quadrangle unit at the scale of 2 inches = 1 mile.

Every effort has been made to fit the soil and vegetation boundaries to the topography of the base map. Land subdivisions have been positioned as accurately as source information and map control points permit. If a precise fit of the data to land subdivisions for small areas is required, ground checks against known corner locations, fence boundaries, or other features should be carried out, preferably by using aerial photographs.

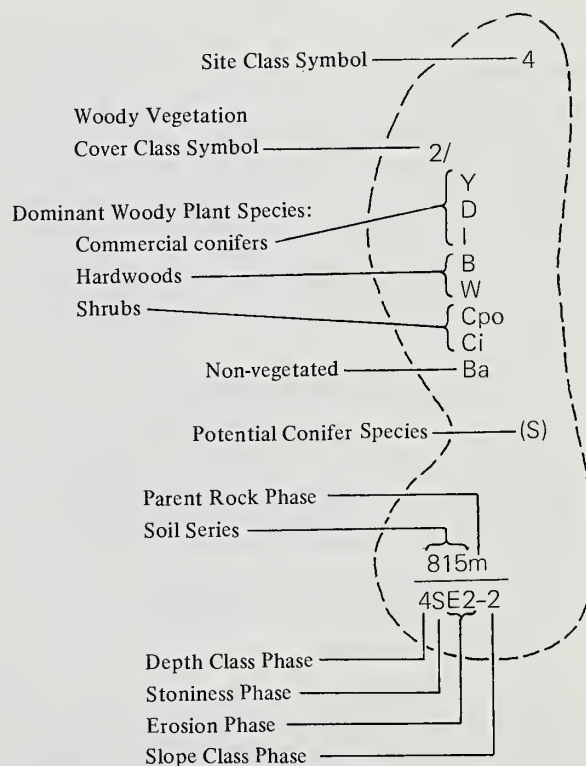
Contour lines, minor roads, small drainages, and other map details are not shown on the maps so as not to obliterate other data. If such map detail is required, refer to maps used as sources for the base information. These maps are listed in the lower right corner of each quadrangle map.

Soil Symbols

Soils are mapped by soil series and phases (depth class, slope class, and certain other soil phases). The Soil Survey Manual (Soil Survey Staff 1951) has been used as a general standard of reference for terminology and concepts. Soils are designated by symbols written as fractions, e.g.:

$$\frac{815}{4S-1} = \frac{\text{Soil Series}}{\text{depth class/other phases/-slope class.}}$$

The various symbols used in a delineated mapping area are shown in the diagram below:



Soil series names are designated by three or four digit numbers in the numerator of the fraction. Soil series variants are soils of limited extent which are

³Personal communication with Helen K. Sharsmith, Senior Herbarium Botanist, University of California, Berkeley, Sept. 11, 1962.

distinctly different but similar and closely related to a known soil series. These are designated by the symbol "V" following the soil series symbol, e.g. 815V. *Parent rock* phases (table 1) are designated by a lower case letter symbol following the soil series symbol, e.g. 815m.

Other soil phases are designated by letters and numbers in the denominator of the fraction. Soil *depth class* is designated by the first digit. *Rockiness, stoniness, and/or erosion* are designated by letters and numbers immediately following the depth class symbol (table 2). The *slope class* in the delineated area is represented by a letter or number symbol which is separated by a hyphen from the other phase symbols (table 1).

In some areas an association of two soils occurs in such an intricate pattern that they cannot be indicated separately at the scale of mapping. Such a *soil complex* is designated by two fractional symbols separated by a vertical line, e.g.,

$$\begin{array}{c|c} 847 & 752 \\ \hline 2-2 & 3-2 \end{array} \quad \text{or} \quad \begin{array}{c|c} 847 & 752 \\ \hline 3-2 & 3-2 \end{array}$$

The dominant soil unit (51 to 80 percent of a delineated area) appears on the left.

Unclassified soil areas are usually agricultural or potentially agricultural lands for which, in many cases, soil surveys have already been made by other agencies, such as the U.S. Soil Conservation Service. Symbols for unclassified soils are "100," "200," or "400," but are not in fraction form; sometimes a letter follows the number indicating further breakdown of the general definition of the symbols, e.g., 200W (table 1).

Miscellaneous land types have little or no soil, or soil that cannot feasibly be classified. They are distinguished as a group by the symbol "700," also not in fraction form. Subdivisions within the groups are shown by letter symbols in parentheses following the "700" symbol, e.g. 700(CK) (table 1).

Soil Classification

Classification System

The soil classification system currently used was adopted for general use in the United States in 1965 (Basile 1971; Soil Survey Staff 1960). It has six categories. The broadest category is the order, followed by suborder, great group, subgroup, family, and the series. The criteria used as a basis for classification are soil properties that are observable and measurable. The placement of the smallest unit—the soil series—in the current system may change as more precise information becomes available.

The 10 soil orders recognized are defined as follows:

Entisols: young mineral soils that do not have genetic horizons or barely have the beginning of such horizons.

Inceptisols: mineral soils in which horizons have started to develop, and are young but not on recent land surfaces.

Mollisols: very dark colored and base-rich soils with a thick, friable, dark-colored surface layer.

Alfisols: soils that have clay-enriched B horizons with medium or high base saturation and usually have light-colored surface horizons.

Ultisols: well developed soils that have clay-enriched B horizons with low base supply or low base saturation decreasing with depth.

Vertisols: clayey soils that shrink and have wide deep cracks during dry periods and that swell closing the cracks, in moist seasons.

Aridisols: primarily soils in dry areas, pale in color and generally soft when dry or have distinct structure.

Spodosols: usually gray to light gray podzol or podzolic soils, generally infertile, and developed from siliceous parent materials in cool humid climates.

Oxisols: reddish, yellowish, or grayish soils of tropical and subtropical regions, are deeply weathered, and formed on gentle slopes on old surfaces.

Histosols: soils that are dominantly organic from bogs, peats, and mucks.

Classification of Soils

The placement of the soil series of the French Gulch Quadrangle in the current soil classification system is still tentative because both the soils and the system are under continual study. Five orders are represented in the Quadrangle: Entisols, Inceptisols, Mollisols, Alfisols, and Ultisols. They are further classified by subgroup and family (table 6) (Soil Survey Staff 1972).

Vegetation Symbols

Plant species are represented by letter symbols, such as Af for chamise (*Adenostoma fasciculatum*) and D for Douglas-fir (*Pseudotsuga menziesii*) (table 3). Dominant species in a delineated area (excluding individual grass species and most associated herbs) are indicated by one or more symbols which may be grouped. Each group of symbols represents an element which may be either a broad kind of vegetation (commercial conifers, minor conifers, hardwoods, shrubs, bushy herbs, grass, marsh) or some other land-

scape unit (nonvegetated and rock, cultivated, urban-industrial). Each delineated area may have one or more elements occupying from 5 to 100 percent of the ground area. Elements can be determined on the map by grouping the appropriate symbols. For example, an area has the symbols Y D I B W Cpo Ci Ba. They represent four elements, respectively: commercial conifers (YDI), hardwoods (BW), shrubs (CpoCi), and non-vegetated (Ba).

Elements are listed in order of abundance with the one listed first making up the greatest proportion of the cover. Likewise, the order of symbols within an element indicates the relative abundance of the species within that element. Symbols of vegetation elements not classified as to species (grass, marsh, and bushy herbs) and the non-vegetation element (barren) are included among plant symbols in proper order of abundance of elements or may stand alone as the case may be.

In the above example, there is a greater proportion of commercial conifers than hardwoods, shrubs, or grass, and there is more Y than D, more D than I. But the proportion of I is not necessarily greater than B or Ba. If five or more species symbols appear in one group, the relative abundance of the species is variable within the delineated area. For further information on the classification system, see the folio titled "Timber Stand and Vegetation-Soil Maps of California," Jan. 15, 1949 (U.S. Forest Serv. California Forest and Range Exp. Stn. 1949), and the "Field Manual, Soil-Vegetation Surveys in California" (U.S. Forest Serv., California Forest and Range Exp. Stn. 1954).

A species must occupy 20 percent or more of the crown space of the element to which it belongs to be mapped in a delineated area. The individual element also must comprise the following minimum parts of a delineated area: crowns of commercial conifers—5 percent or more of the ground space; hardwoods and minor conifers—each at least 5 percent, or 20 percent when in combination with 20 percent or more of commercial conifers; shrubs—at least 5 percent, or 20 percent when in combination with 20 percent or more of a tree element; and all other elements—at least 20 percent if they appear on the map.

In some areas, logging, burning, or clearing may have eliminated one or more (or all) species of commercial conifer trees. In such areas, symbols of conifers eliminated or reduced to less than 5 percent cover are shown in parentheses.

The approximate percent of the ground covered by woody vegetation (i.e., canopy of all trees and shrubs combined) is shown as a *cover* class symbol

which appears as a number above or to the left of the vegetation species symbols and separated from them by a line, e.g., 2/YDIBWCpoCiBa. The cover class symbols and explanation are:

	<i>Cover class</i>	<i>Ground covered (percent)</i>
Cover symbol:		
1	Dense	> 80
2	Semidense	50 - 80
3	Open	20 - 50
4	Very open	5 - 20
5	Extremely open	< 5

In some areas, distinct vegetation units cannot be shown separately at the scale of mapping. In such cases, two groups of cover class and species symbols are shown with a vertical line separating them, e.g.,

1	2
D	T
R	M
T	Ba

Type-acre soil-vegetation sampling plots are established in a mapped area. These plots are not uniformly distributed because their locations are chosen to be representative of the more extensive (or sometimes unusual) combinations of soil and vegetation. A detailed soil profile description and intensive vegetation inventory are made at these sites. Plot locations (*tables 4, 5*) are shown on the map by circled numbers, e.g., ③.

Timber Site Symbols

Site quality (capacity of the land for growing timber) is indicated on the map by Arabic numbers. Pine, fir, pine-Douglas-fir, and pine-Douglas-fir-fir types are graded in terms of the total height that average dominant trees reach at 300 years of age, by 25-foot classes (Dunning 1942). These classes are designated by numbers 1 through 6:

	<i>Site Index</i>		<i>Site class symbol used by Forest Service, Calif. Region</i>
Class symbol:	<i>Height of dominant trees</i>		
	<i>At 100 years</i>	<i>At 300 years</i>	
	<i>(feet)</i>		
1	52	75	V
2	67	100	IV
3	82	125	III
4	102	150	II
5	122	175	I
6	140	200	IA

In areas without climate and soil suitable for growing commercial conifer timber crops, the site index symbol is omitted.

Soil and Vegetation Boundaries







Soil or vegetation boundaries or both are normally shown on the map by dashed lines. In some places, however, it is necessary to show a soil boundary distinct from a vegetation boundary. Where this is done, a dotted line indicates a soil boundary. When needed, a double-headed arrow is used to show the appropriate adjacent soil.

Other Features on Map

Photo centers: The locations of the centers of aerial photographs from which the map data are compiled are shown on the map by large dots. This will facilitate use of the map with aerial photos.

Roads: Some are shown for orientation purposes.

Special features: Features too small to delineate are shown by these symbols:

	Spring
	Wet spot
	Small marsh or wet meadow
	Severely eroded spot
	Prominent rock outcrop
	Rock escarpment
	Pond or reservoir
	Named peak

TABLES TO ACCOMPANY MAPS

Explanation of Tables

Table 1 lists the soil series mapped in the Quadrangle and gives the more important characteristics of each. The soil series names used in this report are based on present concepts of the series and are subject to review and final correlation. Variations must be expected in characteristics listed, as terms (except slope class) apply to the soil series in general. Detailed descriptions of individual soil series are on file at the University of California, Departments of Soils and Plant Nutrition at Berkeley and Davis.

Table 2 gives a legend for soil series, phases, and other units mapped, other than slope, including permeability, general drainage, erosion hazard, and suitability for commercial timber production, and for extensive range use.

Table 3 lists the symbols of plant species and other landscape units occurring on the maps, and symbols of species not mapped due to scale of mapping, but recorded on type-acre plots or observed in the Quadrangle area. Common (Jepson 1923; McMinn 1939) and scientific names (Munz and Keck 1959; Munz 1968), growth habit, sprouting nature, and browse values are given for each species. Browse values are based on values reported by Sampson and Jespersen (1963).

Table 4 presents a portion of the data taken from type-acre sampling plots that is principally concerned with livestock and wildlife use. It includes date of sampling, plot location, aspect and percent slope, soil series and phases, woody cover class (overstory), information on soft chess growing on the plot, percent of ground covered by various vegetation and landscape units as measured below a reference plane 4½ feet above the ground, and a list of woody species with available browse.

The soil series, soil phase, and woody cover class symbols may not correspond to those in the delineated areas of the map in which the plots are located because of scale of mapping. Detailed descriptions of soil profiles at these plot locations are on file at the Pacific Southwest Forest and Range Experiment Station, Berkeley, California.

Soft chess (*Bromus mollis*) is one of the most common annual range grasses in California. Height and stage of maturity of this grass together with date of sampling and other data give an indication of site and kind of season or year for the plot area.

Table 5 lists scientific (Munz and Keck 1959) and common (Abrams 1923-1960; Jepson 1923; Munz and Keck 1959) names of herbaceous species found on the type-acre plots described in *table 4*. Because

percent cover (*table 4*) and composition of herbaceous species often vary from year to year, these are preliminary data describing the plots at date of sampling. More data on percent composition and abundance of plants are on file at the Department of

Agronomy and Range Science, University of California, Davis.

Table 6 lists the five orders of soils found on the Quadrangle: Entisols, Inceptisols, Mollisols, Alfisols, and Ultisols, by soil series, family, and subgroup.

Tables

Table 1 --Soil symbols and some important characteristics of soil series mapped

Soil : series: symbol:	Soil : range : series name :	Depth : (inches):	Color of surface/subsoil :	Texture of surface/subsoil :	Reaction of surface/subsoil :	Parent material :	Relief and slope classes mapped ^{1/}
200	<u>2/</u>						
242	Greenfield	31-60+	Brown/brown	Sandy loam/heavy sandy loam	Slightly acid to neutral/neutral to mildly alka- line	Granitic alluvium	Nearly level to gently sloping (A,B)
400	<u>2/</u>						
522	Redding	10-28 to hard- pan, otherwise 60+	Reddish brown/ red	Gravelly loam/ gravelly clay over hardpan	Strongly to slightly acid/ strongly acid	Old gravelly mixed alluvium	Nearly level to rolling, hummocky (A,AB,B,C)
700	<u>2/</u>						
7117	Musick and Hoda ^{3/}	35-60+	Grayish brown or brown/yellowish red or red	Sandy loam or loam/sandy clay or heavy clay loam	Moderately acid/ strongly acid	Granitic rock	Gently sloping to steep (C,CD,D,2)
7118	Boomer	30-56	Light brown/ reddish brown	Gravelly loam/ gravelly clay loam	Moderately acid/ moderately acid	Metamorphosed basic igneous rock ^{4/}	Hilly to very steep (CD,D,1,2,3)
7118m	Boomer (schist)	30-56	Light brown/ reddish brown	Sandy heavy loam/ gravelly sandy clay loam	Moderately acid/ moderately acid	Schist ^{4/}	Hilly to very steep (3)
7121	Corbett	24-60+	Dark grayish brown/pale brown	Loamy coarse sand/loamy coarse sand	Strongly acid/ moderately acid	Granitic rock	Hilly to very steep (1,2,3, 4)
7125V2	Tish Tang variant 2	20-40	Pale brown/very pale brown	Gravelly loam/ loam	Moderately acid/ strongly acid	Diorite porphyry	Steep to very steep (2,3,4)
7129	Chawanakee and Chaix ^{3/}	18-60	Grayish brown/ very pale brown to light yellowish brown	Coarse sandy loam/coarse sandy loam	Moderately acid/ moderately to strongly acid	Granitic rock	Hilly to very steep (CD,D,2,3,4)
7135	Diamond Springs	20-40	Pale brown to grayish brown/ very pale brown to yellowish red	Very fine sandy loam/clay loam	Moderately to very strongly acid/strongly to very strongly acid	Fine grained acid igneous rock	Hilly to steep (CD,2)
7136	Behemotosh	20-33	Grayish brown/ reddish yellow	Gravelly loam/ cobbly light clay loam	Moderately acid/ moderately acid	Metamorphosed rhyolite	Sloping to very steep (D,2,3,4)
7136L	Behemotosh (landslide) ^{5/}	20-60+	Brown/reddish yellow	Fine sandy loam/ silty clay loam	Strongly acid/ very strongly acid	Fragmented rhyolite and soil material	Steep to very steep (2,3)

Table 1 (continued)

Soil : series: symbol:	Soil : series name	Depth : range : (inches)	Color of : surface/subsoil	Texture of : surface/subsoil	Reaction of : surface/subsoil	Parent : material	Relief and : slope classes mapped
7136V	Behemotosh variant	33-50	Dark grayish brown/strong brown to pink	Loam/clay loam	Moderately acid/ very strongly acid	Deeply weathered acid igneous rock	Gently sloping to steep (2)
716	Holland and Hotaw ^{3/}	24-72+	Grayish brown/ reddish brown to light brown	Loam to coarse sandy loam/clay loam to sandy clay loam	Slightly to moderately acid/ moderately to strongly acid	Granitic rock	Hilly to very steep (D,1,2,3,4)
721	Modesty	17-30	Light brownish gray/very pale yellow	Gravelly coarse sandy loam/ gravelly loam	Strongly acid/ strongly acid	Granitic rock	Hilly to very steep (CD,2,3)
726	Dubakella	14-30	Reddish brown/ yellowish brown	Gravelly loam/ gravelly clay loam	Neutral/neutral	Serpentine	Gently sloping to very steep (2)
728	Neuns	20-40	Dark brown/ yellowish brown	Gravelly sandy loam/gravelly sandy clay loam	Moderately acid/ moderately to strongly acid	Metamorphosed basic igneous rock ^{4/}	Hilly to very steep (CD,1,2,3,4)
728L	Neuns (landslide) ^{5/}	24-60+	Dark brown/ yellowish brown	Gravelly sandy loam/gravelly sandy clay loam	Moderately acid moderately to strongly acid	Fragmented basic igneous rock and soil material	Very steep (3)
728m	Neuns (schist)	15-50	Dark brown/ yellowish brown	Gravelly sandy loam/gravelly sandy clay loam	Moderately acid moderately to strongly acid	Schist ^{4/}	Hilly to very steep (2,3,4)
741	Auburn	10-28	Strong brown to yellowish red/ reddish brown to yellowish red	Silt loam/silt loam	Slightly to moderately acid/ slightly acid to neutral	Schistose to massive metamorphosed basic rocks ^{4/}	Hilly to very steep (CD,2,3)
741L	Exchequer	3-16	Yellowish red/	Rocky silt loam/	Slightly acid/	Schistose ^{4/} or altered basic igneous rock	Rolling to steep (1)
743	Auberry	30-60	Grayish brown/ brown	Coarse sandy loam/sandy clay loam	Slightly to moderately acid/ moderately to strongly acid	Granitic rock	Rolling to very steep (B,C,CD,2,3)
748	Sobrante	20-40	Reddish brown/ yellowish red	Silt loam/clay loam	Moderately acid/ slightly acid	Schistose to massive metamorphosed basic rock ^{4/}	Rolling to very steep (B,CD,2,3)
757	Sierra	30-60+	Brown/yellowish red to red	Coarse sandy loam/loam to clay loam	Moderately acid slightly acid	Strongly weathered granitic rock	Rolling to very steep (B,C,CD,D,2,3)
759	Kanaka	20-40+	Brown/very pale brown	Sandy loam/ heavy loam	Moderately to strongly acid/ strongly acid	Granitic rock	Gently sloping to very steep (B,C,CD,D,2,3)
771	Henneke	7-20	Brown/brown	Gravelly loam/very gravel- ly clay loam	Slightly acid/ neutral	Serpentinite	Steep to very steep (2)
775	Kidd	5-18	Pale brown/ light gray	Gravelly sandy loam/gravelly sandy loam	Moderately acid/ strongly acid	Rhyolitic rock	Hilly to very steep (2,3,4)
778	Huse	8-22	Reddish brown/ brown	Stony clay loam/ very stony loam	Neutral/ neutral	Peridotite	Gently sloping to steep (2,3)
779	Stonyford	12-28	Brown/dark reddish brown	Gravelly clay loam/gravelly clay loam	neutral/ moderately acid to neutral	Metamorphosed basic igneous rock ^{4/}	Hilly to very steep (CD,2,3)
781	Goulding	8-25	Brown/brown	Gravelly loam/ very gravelly loam	Slightly acid/ slightly acid	Metamorphosed basic igneous rock ^{4/}	Steep to very steep (CD,D,2,3,4)

Table 1 (continued)

Soil : series: symbol:	Soil : series name	Depth : range : (inches):	Color of surface/subsoil	Texture of surface/subsoil	Reaction of surface/subsoil	Parent material	Relief and slope classes mapped/
784	Tollhouse	10-20	Dark grayish brown	Coarse sandy loam	Neutral to moderately acid	Granitic rock	Steep to very steep (3)
811	Marpa	20-40	Brown/light brown	Very gravelly heavy loam/very gravelly clay loam	Slightly acid/strongly acid	Shale and sandstone	Steep to very steep (1,2,3,4)
815	Josephine	30-60+	Brown to reddish brown/strong brown to yellowish red	Loam/clay loam	Moderately acid/moderately to strongly acid	Sandstone and shale	Moderately steep to very steep (1,2,3)
815m	Josephine (schist)	30-60+	Brown to reddish brown/strong brown to yellowish red	Loam/clay loam	Moderately acid/moderately to strongly acid	Metamorphosed sedimentary rock	Moderately steep to very steep (2,3)
816	Sites	36-60+	Brown to reddish brown/red	Loam/clay	Slightly to moderately acid/strongly acid	Metamorphosed sedimentary rock	Rolling to steep (1,2,3)
820	Sheetiron	21-42	Dark grayish brown/pale brown	Gravelly light loam/gravelly heavy loam	Moderately acid/strongly acid	Metamorphosed sedimentary rocks	Hilly to very steep (2,3)
824V	Fiddletown Variant	20-60+	Dark grayish brown/brown or dark brown	Loam/clay loam	Slightly acid/moderately acid	Metamorphosed sedimentary rock	Very steep (3)
8322	San Andreas	20-40	Brown/brown to yellowish brown	Fine sandy loam/fine sandy loam	Moderately acid/moderately acid	Mica schist ⁴	Sloping to steep (B,C,D,2,3,4)
837	Millsholm	10-20	Brown/brown	Silt loam/silt clay loam	Slightly acid/neutral	Sandstone and shale	Hilly to very steep (3)
837g	Millsholm (conglomerate)	8-30	Brown/brown	Gravelly loam/gravelly loam	Slightly acid/neutral	Conglomerate	Hilly to very steep (3)
871	Los Gatos	24-48	Brown/yellowish red or reddish brown	Light clay loam/clay loam	Slightly acid/moderately acid	Sandstone and shale	Hilly to very steep (2,3)
871L	Los Gatos (landslide ⁵ /	24-60+	Brown/yellowish red or reddish brown	Very gravelly loam/very gravelly clay loam	Slightly acid/moderately acid	Sandstone and shale landslide debris	Gently sloping to very steep (1)
871m	Los Gatos (schist)	12-36	Brown/reddish brown	Gravelly loam/gravelly clay loam	Slightly acid/slightly acid	Metamorphosed sedimentary rocks	Gently sloping to very steep (2,3)
872	Maymen	4-20	Brown/light yellowish brown	Gravelly sandy loam/gravelly loam	Moderately acid/strongly acid	Sandstone and shale	Rolling to very steep (1,2,3,4)
872m	Maymen (schist)	4-20	Pale brown/pale brown	Gravelly loam/gravelly loam	Slightly acid/moderately acid	Metamorphosed sedimentary rocks	Hilly to very steep (2,3)
926	Horseshoe	48-60+	Reddish brown to yellowish red/yellowish red to red	Gravelly loam/gravelly clay loam	Moderately acid/very strongly to strongly acid	Weakly consolidated gravely sediments	Nearly level to steep (C,CD,1,2)
941	Newville and Newtown ³ /	40-60+	Brown/brown or pale brown	Gravelly loam/clay	Slightly acid to neutral/strongly acid to slightly alkaline	Weakly consolidated gravely sediments	Nearly level to steep (B,C,D)

(Footnotes follow on the next page)

Table 1-Footnotes

<u>1/ Slope class symbol</u>	<u>Percent slope</u>
A	0-3
B	3-8
C	8-15
D	15-30
AB	0-8
AC	0-15
CD	8-30
1	0-30
2	30-50
3	50-70
4	70 and greater

2/ Unclassified soils and miscellaneous land types mapped are:

<u>Symbol</u>	
200	Alluvial land (secondary soils on bottomland)
200 R	Alluvial land with 10-50 percent surface rock
200 W	Wet alluvial land
400	Soils on terraces and benches
700(AK)	Colluvial land of granitic rock material
700(AK)R	Colluvial land of granitic rock material with 10-50 percent rock outcrop
700(AP)	Mine dumps and pits of acid igneous rock material
700(AR)	Rockland (50-90 percent rockiness) of granitic rock material
700(AW)	River wash of acid igneous rock material
700(BK)	Colluvial land of basic igneous rock material
700(BK)R	Colluvial land of basic igneous rock material with 10-50 percent rock outcrop or surface rock
700(BO)	Rock outcrop, basic igneous (90-100 percent rockiness).
700(BR)	Rockland, basic igneous (50-90 percent rockiness)
700(BR)K	Rockland, basic igneous (50-90 percent rockiness) with 10-50 percent colluvial soil material
700(BS)	Landslide, soil and rock of basic igneous origin
700(CK)	Colluvial land of sedimentary rock material
700(CK)O	Colluvial land of sedimentary rock material with 10-50 percent rock outcrop
700(CK)R	Colluvial land of sedimentary rock material with 10-50 percent rock outcrop or surface rock
700(CO)	Rock outcrop, sedimentary
700(CR)	Rockland, sedimentary (50-90 percent rockiness)
700(DH)	Dredge tailings
700(DK)	Colluvial land of mixed or undetermined rock material
700(DK)R	Colluvial land of mixed or undetermined rock material with 10-15 percent rock outcrop or surface rock
700(DP)	Mine dumps and pits of mixed or undetermined rock material
700(DR)	Rockland, mixed or undetermined rock material (50-90 percent rockiness)
700(DS)	Landslide, mixed or undetermined rock and soil material
700(DW)	Riverwash of mixed or undetermined rock material
700(MK)	Colluvial land of schistose rock and soil material
700(MO)	Rock outcrop, schistose (90-100 percent rockiness)

3/ The mapping units represented by these symbols have mixtures of the soil series designated.

The second soil series named has been established since the time of field studies. The characteristics listed include those of both series as now defined.

4/ In this area rock may have been either igneous or sedimentary before metamorphism.

5/ The soil is formed on material that has undergone mass movement.

Table 2.--Selected behavior characteristics and productivity estimates for soil series and phases, unclassified soils, and miscellaneous land types

Map symbol	Soil series name	Soil phase symbols	1/: Permeability	2/: General drainage	3/: Erosion hazard	4/: Estimated suitabilities for Timber production	5/: Extensive range use
200	<u>7/</u>		Rapid	Good <u>8/</u>	Slight <u>9/</u>	Unsuited to high	Medium
200R	<u>7/</u>		Rapid	Good <u>8/</u>	Moderate <u>9/</u>	High	Medium
242	Greenfield	5	Moderately rapid	Good	Moderate <u>9/</u>	Unsuited	Medium
400	<u>7/</u>		Slow to moderate	Good	Slight <u>9/</u>	Unsuited to high	Medium
522	Redding	2,2S,3	Slow	Good <u>10/</u>	Moderate <u>9/</u>	Unsuited	Low
700	<u>7/</u>		Rapid to impermeable	Excessive	Slight to very high	Unsuited to medium	Very low
7117	Musick and Hoda soils	4,5	Slow	Good	High	Medium	Low
7117	Musick and Hoda soils	5E	Slow	Good	Very high	Medium	Very low
7118	Boomer	3,3S,4,4S	Moderate	Good	Moderate	Medium	Medium to low
7118	Boomer	3E	Moderate	Excessive	High <u>11/</u>	Medium	Low <u>11/</u>
7118m	Boomer (schist)	3,3S,4,4S	Moderately rapid	Good	High <u>11/</u>	Medium	Low <u>11/</u>
7121	Corbett	1E,1RE,2E	Rapid	Excessive	Very high	Unsuited to medium	Unsuited
7121	Corbett	2,2R,3R	Rapid	Excessive	High	Unsuited to medium	Unsuited
7121	Corbett	2R1,2S,3,3R1,4	Rapid	Excessive	High	Medium	Unsuited
7121	Corbett	2RE,3E,3RE	Rapid	Excessive	Very high	Medium	Unsuited
7125V2	Tish Tang variant 2	2,2S,3	Moderate	Good	Moderate	Unsuited to medium	Low to very low
7125V2	Tish Tang variant 2	2E	Moderate	Good	High <u>11/</u>	Low	Very low <u>11/</u>
7129	Chawanakee & Chaix	1E,2E,2RE	Moderately rapid	Excessive	Very high	Unsuited to medium	Unsuited
7129	Chawanakee & Chaix	2,2R,2R1,2S	Moderately rapid	Good to excessive	High	Low to medium	Low
7129	Chaix	3,4,4R1,5	Moderately rapid	Good to excessive	High	Medium	Low
7129	Chaix	3E,3RE,4E	Moderately rapid	Good to excessive	Very high	Medium	Unsuited
7135	Diamond Springs	2R,3,3S	Moderate	Good	Moderate to high	Medium	Low
7135	Diamond Springs	3E,3RE	Moderate	Good	High	Low to medium	Very low
7136	Behemotosh	2R,2R1,3R	Moderate	Good	High <u>11/</u>	Low to medium	Low <u>11/</u>
7136	Behemotosh	2S,3S	Moderate	Good	Moderate	Low to medium	Low
7136	Behemotosh	2SE	Moderate	Excessive	Very high <u>11/</u>	Low	Very low <u>11/</u>

Table 2 (continued)

Map symbol:	Soil series name:	Soil phase symbols ^{1/} :	Permeability	General drainage	Erosion hazard	Estimated suitabilities for Timber production	Extensive range use
7136L	Behemotosh (landslide)	3S,5S	Moderate	Good	High ^{12/}	Low to medium	Very low
7136V	Behemotosh variant	3,3S,4,4S	Moderate	Good	Moderate	Medium	Low
716	Holland & Hotaw	3,4,5	Moderate	Good	High	Medium	Medium to low
721	Modesty	1RE	Moderately rapid	Excessive	Very high	Unsuited	Unsuited
721	Modesty	2	Moderately rapid	Good to excessive	High	Low to medium	Low
721	Modesty	2E,2RE,2SE	Moderately rapid	Excessive	Very high	Unsuited to medium	Unsuited
721	Modesty	2R,2S	Moderately rapid	Good to excessive	High	Unsuited to medium	Low
721	Modesty	3,3S	Moderately rapid	Good to excessive	High	Medium	Low
726	Dubakella	3R1	Moderate	Good	Very high ^{11/}	Medium	Low ^{11/}
728	Neuns	2,2R,2S,3,3S	Moderate	Good to excessive	Moderate	Low to medium	Low to medium
728L	Neuns (landslide)	3S	Moderate	Good	High ^{11,12/}	Medium	Low ^{11/}
728m	Neuns (schist)	2,3,3S,5S	Moderate	Good	Moderate to high	Medium	Low
728m	Neuns (schist)	2S	Moderate	Good	Moderate to high	Low to medium	Low
741	Auburn	2,2S	Moderate	Good	Moderate	Unsuited	Medium
7411	Exchequer	1	Moderate	Good to excessive	Moderate ^{9/}	Unsuited	Low
743	Auberry	2E	Moderate	Good	Very high ^{11/}	Unsuited	Unsuited ^{11/}
743	Auberry	3,4	Moderate	Good	High	Unsuited to questionable	Medium
748	Sobrante	3	Moderate	Good	Moderate	Unsuited	Medium
757	Sierra	3,3R,4,5	Moderate	Good	Moderate to high	Unsuited to questionable	Medium
757	Sierra	3E,4E	Moderate	Good	High to very high	Unsuited to questionable	Very low
759	Kanaka	1RE	Moderately rapid	Excessive	Very high ^{11/}	Unsuited	Unsuited ^{11/}
759	Kanaka	2,2R1,2S,3,3R1	Moderately rapid	Excessive	High	Unsuited	Medium
759	Kanaka	2R,3R	Moderately rapid	Excessive	High	Unsuited	Medium to low
771	Henneke	2R	Moderate	Good	Moderate	Unsuited	Low
775	Kidd	1R,1S	Moderately rapid	Excessive	High	Unsuited	Low
775	Kidd	1RE,1SE	Moderately rapid	Excessive	Very high ^{11/}	Unsuited	Unsuited ^{11/}
775	Kidd	2R	Moderately rapid	Good to excessive	High	Unsuited to low	Low

Table 2 (continued)

Map symbol:	Soil series name:	Soil phase symbols ^{1/} :	Permeability	General drainage	Erosion hazard	Estimated suitabilities for	
						Timber production	Extensive range use
775	Kidd	2S	Moderately rapid	Good to excessive	High	Unsuited to medium	Low
778	Huse	2R	Rapid	Good to excessive	Moderate	Low	Very low
779	Stonyford	2,2R,2S,3,3S	Moderate to slow	Good to excessive	Moderate to high	Unsuited	Very low
779	Stonyford	2SE,3SE	Moderate to slow	Good to excessive	High	Unsuited	Unsuited
781	Goulding	1R,1S,2R,2S	Moderate	Good to excessive	Moderate	Unsuited	Low to very low
781	Goulding	2RE,2SE	Moderate	Good to excessive	High ^{11/}	Unsuited	Unsuited ^{11/}
781	Goulding	3S	Moderate	Good	Moderate	Unsuited	Low to medium
784	Tollhouse	1E	Rapid	Excessive	Very high ^{11/}	Unsuited	Unsuited ^{11/}
811	Marpa	2R,2S,3S,4S	Moderate	Good	Moderate	Low to medium	Low to medium
815	Josephine	3,3S,4,4S,5	Moderate	Good	Moderate	Medium	Medium to low
815m	Josephine (schist)	3,3S	Moderate	Good	Moderate	Medium	Medium to low
816	Sites	3S,4S	Moderate	Good	Moderate	Medium	Medium
820	Sheetiron	2S	Moderate	Good to excessive	Moderate	Low to medium	Low
820	Sheetiron	3S	Moderate	Good	Moderate	Medium	Low
824V	Fiddletown variant	3S	Moderately rapid	Good	Moderate ^{11/} to high	Unsuited to medium	Low ^{11/}
8322	San Andreas	2	Moderate	Good	Moderate	Unsuited to questionable	Medium
8322	San Andreas	2R,2S	Moderate	Good to excessive	Moderate	Unsuited	Low to medium
837	Millsholm	2S	Moderate	Good	Moderate ^{11/} to high	Unsuited	Medium to ^{11/} low
837g	Millsholm (conglomerate)	2S	Moderate	Good	Moderate ^{11/} to high	Unsuited	Medium to ^{11/} low
871	Los Gatos	3S	Moderate	Good	Moderate	Unsuited	Low
871L	Los Gatos (landslide)	5S	Moderately rapid	Good	Slight ^{12/}	Unsuited	Low
871m	Los Gatos (schist)	2S	Moderate	Good to excessive	Moderate to high	Unsuited	Very low
871m	Los Gatos (schist)	3	Moderate	Good	Moderate ^{11/}	Unsuited	Low ^{11/}
872	Maymen	1,1R,1S	Moderate to rapid	Excessive	High	Unsuited	Very low
872	Maymen	1E,1SE,2SE	Rapid	Excessive	High ^{11/}	Unsuited	Unsuited ^{11/}
872	Maymen	2,2R,2S	Moderate to rapid	Excessive	Moderate to high	Unsuited	Very low to low
872m	Maymen (schist)	1R,2R	Moderate to rapid	Excessive	High ^{11/}	Unsuited	Very low ^{11/}

Table 2 (continued)

Map symbol	Soil series name	Soil phase symbols ^{1/}	Permeability	General drainage	Erosion hazard	Estimated suitabilities for Timber production	Extensive range use
926	Horseshoe	5,5S	Moderate	Good	Moderate	Medium	Medium to low
926	Horseshoe	5SE	Moderate	Good	Moderate ^{9/} to high	Medium	Low
941	Newville & Newtown	3S	Slow	Good	Moderate ^{9/} to high	Unsuited	Low
941	Newville & Newtown	3SE	Slow	Good	Moderate ^{9/} to high	Unsuited	Low
941	Newville & Newtown	5S	Slow	Good	Moderate ^{9/} to high	Unsuited	Medium to low

^{1/} Phase symbols listed here are:

Symbol	Depth class	Depth (feet)	Symbol	Surface rock (percent)	Symbol	Stoniness	Symbol	Erosion
1	Very shallow	<1	R	10 - 50	S	Coarse fragments in the soil (gravel, cobbles, or stones) making up 20 percent or more of the soil's volume.	E	Severe
2	Shallow	1-2	R1	2 - 10				
3	Moderately shallow	2-3						
4	Moderately deep	3-4						
5	Deep	>4						

^{2/} Permeability: rate of water movement through the soil profile, based on the least permeable layer within the soil--slow, moderate, moderately rapid, rapid.

^{3/} General drainage: rate and extent of removal of water from the soil, either by runoff or by percolation--excessive, good (well-drained), imperfect, poor.

^{4/} Erosion hazard: probable susceptibility of a soil to erosion on a 30 to 50 percent slope (slope class 2) after significant disturbance of protective vegetative cover--slight, moderate, high, very high.

^{5/} Estimated suitability for commercial timber production: based on predominant site index determinations as related to soil and climatic characteristics regardless of current vegetative cover in an area. Relative terms are: unsuited = nontimberland; low = sites 1, 2; medium = sites 3, 4; high = site 5; questionable = conclusive evidence of suitability is lacking.

^{6/} Estimated suitability for extensive range use: based on observations of natural forage production, use experience over wide areas, and soil and climatic characteristics. Regardless of current vegetative cover, estimates are potential suitability applied to open areas, either natural or cleared, under extensive management (without seeding or fertilization) with average herbaceous cover conditions as related to soil type. Factors such as rockiness, topography, and erosion hazard are also considered. Estimates should not be interpreted as necessarily applying to suitability of soils for forage production under more intensive management involving seeding, fertilization or irrigation. Relative terms are: unsuited, very low, low, medium, high, very high; unless otherwise indicated, they are applicable to soils of slope classes 1 and 2 (0 to 50 percent).

^{7/} Unclassified soils and miscellaneous land types mapped are listed in footnote 2 to table 1.

^{8/} Occasionally subject to flooding.

^{9/} For soils with slopes less than 30 percent.

^{10/} Soil rests abruptly on an impermeable iron-silica cemented hardpan.

^{11/} For soils with slopes steeper than 50 percent.

^{12/} May be subject to further movement, especially if disturbed or in years of above normal precipitation.

Table 3 --Plant species and miscellaneous elements mapped and observed including their growth habit, sprouting nature, and browse values

Map : symbol :	Common name :	Scientific name :	Growth : habit :	Sprout : nature 1/	Browse value 2/				
					H	C	S	G	D
A	White alder	<i>Alnus rhombifolia</i>	Tree	S	5	4-5	3-4	3-4	3-5
Aa ^{4/}	Western service berry	<i>Amelanchier pallida</i>	Shrub	S	3-4	2-3	2-3	2	2-3
Aci	Vine maple	<i>Acer circinatum</i>	Shrub	S	4-5	3-4	3-4	3-4	2-4
Aec	California buckeye (Shrub)	<i>Aesculus californica</i>	Shrub	S	5	4	3-4	3-4	1-2
Af	Chamise	<i>Adenostoma fasciculatum</i>	Shrub	S	5	4-5	2-3	2-3	2-3
Am	Common manzanita	<i>Arctostaphylos manzanita</i>	Shrub	N	5	5	5	4-5	4-5
Amx ^{5/}	Shingletown manzanita	<i>Arctostaphylos manzanita wieslanderii</i>	Shrub	N-S	5	5	5	4-5	4-5
An	Pinemat manzanita	<i>Arctostaphylos nevadensis</i>	Shrub	S	5	5	4-5	4-5	4-5
Ap	Greenleaf manzanita	<i>Arctostaphylos patula</i>	Shrub	S	5	5	4-5	4-5	3-4
App	Pine manzanita	<i>Arctostaphylos patula platyphylla</i>	Shrub	N	5	5	4-5	4-5	4-5
Aro ^{6,7/}	Roof manzanita	<i>Arctostaphylos roofii</i>	Shrub	S	5	5	4	4-5	4-5
Ate ^{4/}	Mountain alder	<i>Alnus tenuifolia</i>	Shrub	U	4-5	3-4	2-3	1-2	1-2
Av	Whiteleaf manzanita	<i>Arctostaphylos viscida</i>	Shrub	N	5	5	5	4-5	4-5
Avc	Balaklala manzanita	<i>Arctostaphylos canescens x viscida</i>	Shrub	N	5	5	5	4-5	4-5
B	California black oak	<i>Quercus kelloggii</i>	Tree	S	4-5	2-4	3-4	3-4	1-2
Ba ^{3/}	--	--	--	--	--	--	--	--	--
C	Canyon live oak	<i>Quercus chrysolepis</i>	Tree	S	5	5	5	5	3-4
Cao ^{5/}	Spice-bush	<i>Calycanthus occidentalis</i>	Shrub	S	5	5	5	5	5
Cb	Western mountain mahogany	<i>Cercocarpus betuloides</i>	Shrub	S	2-4	2	1-2	1-2	1
Cc	Buck brush	<i>Ceanothus cuneatus</i>	Shrub	N	5	4	2-3	2-3	3
Cco	Mountain whitethorn	<i>Ceanothus cordulatus</i>	Shrub	S, N	5	4	3	2-3	1-2
Cec	California redbud	<i>Cercis occidentalis</i>	Shrub	S	4-5	4-5	4	3-4	4-5
Chb ^{4/}	Bloomer goldenbush	<i>Haplopappus bloomeri</i>	Shrub	U	5	5	4	4	4
Ci ^{8/}	Deer brush	<i>Ceanothus integerrimus</i>	Shrub	S, N	3	2-3	1-2	1-2	1-2
Cla ^{4/}	Pipe-stem clematis	<i>Clematis lasiantha</i>	Vine	--	--	--	--	--	--
Cle	Lemmon ceanothus	<i>Ceanothus lemmonii</i>	Shrub	S	5	4-5	3-4	3-4	3-4
Cn	Pacific dogwood	<i>Cornus nuttallii</i>	Shrub	S	5	5	3-4	3-4	3-4
Cos ^{5/}	Miners dogwood	<i>Cornus sessilis</i>	Shrub	S	5	5	4-5	4-5	3-5
Cpj	Trinity squaw carpet	<i>Ceanothus prostratus laxus</i>	Shrub	U	5	5	4-5	3-4	2-4
Cpo	Squaw carpet	<i>Ceanothus prostratus</i>	Shrub	N	5	5	4-5	3-4	2-4
Cr	California hazelnut	<i>Corylus cornuta californica</i>	Shrub	S	4-5	4-5	4	3-4	3-4
Cs	Bush chinquapin	<i>Chrysolepis sempervirens</i>	Shrub	S	5	5	4-5	4-5	4-5
Cu ^{3/}	--	--	--	--	--	--	--	--	--
D	Douglas-fir	<i>Pseudotsuga menziesii</i>	Tree	N	5	5	4-5	4-5	4-5

Table 3 (continued)

Map symbol	Common name	Scientific name	Growth habit	Sprout ₁ / nature	Browse value 2/ H : C : S : G : D :					
D'	Blue oak	Quercus douglasii	Tree	S	4-5	4	3-4	3-4	1-2	
Dp	Digger pine	Pinus sabiniana	Tree	N	5	5	5	5	5	
Dr	Bush poppy	Dendromecon rigida	Shrub	S	5	4-5	3-4	3-4	3-4	
Ec	California yerba santa	Eriodictyon californicum	Shrub	S	5	5	4-5	4-5	3-4	
Fd ⁴ /	Foothill ash	Fraxinus dipetala	Shrub	S	4-5	5	3-4	3	2-3	
G	Oregon oak	Quercus garryana	Tree	S	5	4-5	4-5	4-5	2-3	
Gf	Fremont silktassel	Garrya fremontii	Shrub	S	5	4-5	2-3	2-3	2-3	
Gr ³ /	--	--	--	--	--	--	--	--	--	
H ⁴ /	California buckeye	Aesculus californica	Tree	S	5	4	3-4	3-4	1-2	
Hb ³ /	--	--	--	--	--	--	--	--	--	
Hp ⁴ /	Klamath weed	Hypericum perforatum	Herb	S	5	4-5	3-5	3-4	3-4	
I	Incense-cedar	Calocedrus decurrens	Tree	N	5	4-5	4-5	3-5	3-5	
J	Jeffrey pine	Pinus jeffreyi	Tree	N	5	5	4-5	3-5	3-5	
K	Knobcone pine	Pinus attenuata	Tree	N	5	5	5	5	5	
Lcr	Big deervetch	Lotus crassifolius	Herb	U	5	5	5	5	4-5	
Lde	Shrub tan oak	Lithocarpus densiflora echinoides	Shrub	S	5	5	5	4-5	1-2	
Led ⁶ /	Sierra-laurel	Leucothoe davisiae	Shrub							
Li ⁴ /	Chaparral honeysuckle	Lonicera interrupta	Shrub	N	5	4-5	4	3-4	2-3	
M	Madrone	Arbutus menziesii	Tree	S	5	4-5	4-5	4-5	3-5	
M	Bigleaf maple	Acer macrophyllum	Tree	U	5	4-5	4	4	3-4	
M' ⁵ /	Oracle oak	Quercus morehus	Tree	S	4-5	2-4	3-4	3-4	1-2	
Md ³ /										
Ny ⁵ /	Macnab cypress	Cupressus macnabiana	Tree	N	5	5	5	4-5	4-5	
O	Oregon ash	Fraxinus latifolia								
Pa	Toyon (Christmas berry)	Heteromeles arbutifolia	Shrub	S	5	5	4-5	2-3	2-3	
Pe	Bitter cherry	Prunus emarginata	Shrub	S	5	3	3-4	3	1-2	
Phc ⁶ /	Pacific ninebark	Physocarpus capitatus	shrub	U	4-5	4-5	3-4	4	4-5	
Pl ⁴ /	California mock orange	Philadelphus lewisii californicus	Shrub	S, N	5	4-5	3-4	3-4	3-4	
Pom ⁴ /	Sword fern	Polystichum munitum	Herb	S	5	5	5	4-5	3-4	
Psu ⁴ /	Sierra plum	Prunus subcordata	Shrub	S	5	2-3	2-3	2-3	1-2	
Pta	Bracken	Pteridium aquilinum pubescens	Herb	S	5	5	5	5	5	
Qc	Scrub canyon live oak	Quercus chrysolepis nana	Shrub	S	5	5	5	4	4	
Qdu	Leather oak	Quercus durata	Shrub	S	5	5	4-5	4	3-5	
Qgb	Brewer oak	Quercus garryana breweri	Shrub	S	5	4-5	4-5	4-5	3-4	
Qk	Scrub black oak	Quercus kelloggii cibata	Shrub	S	4-5	2-4	3-4	3-4	1-2	

Table 3 (continued)

Map symbol :	Common name	Scientific name	Growth habit :	Sprout nature ^{1/} :	Browse value ^{2/}					
					H	C	S	G	D	
Qv	Huckleberry oak	<i>Quercus vaccinifolia</i>	Shrub	S	5	4-5	4-5	4-5	3-4	
Qw	Scrub interior live oak	<i>Quercus wislizenii frutescens</i>	Shrub	S	5	4	3-5	3-4	1-2	
R ^{8/}	California red fir	<i>Abies magnifica</i>	Tree	N	5	4-5	4-5	3-5	3-5	
Rcc	Thickleaf coffeeberry	<i>Rhamnus californica crassifolia</i>	Shrub	S	5	3-4	2-4	2-4	2-4	
Rci ^{4/}	Hollyleaf redberry	<i>Rhamnus crocea ilicifolia</i>	Shrub	S	5	2-3	2-3	1-2	1-2	
Rco ^{4/}	Sierra coffeeberry	<i>Rhamnus rubra obtusissima</i>	Shrub	S	5	4-5	3-5	3-4	3-4	
Rct	Chaparral coffeeberry	<i>Rhamnus californica tomentella</i>	Shrub	S	5	2-3	2-3	1-2	1-2	
Rd	Poison oak	<i>Rhus diversiloba</i>	Shrub	S	2-3	3-4	3-4	3-4	2-3	
Rho ^{5/}	Western azalea	<i>Rhododendron occidentale</i>	Shrub	S	5	5	5	5	5	
Rle ^{4/}	Western raspberry	<i>Rubus leucodermis</i>	Shrub	S	5	5	4-5	3-5	3-4	
Rox ^{4/}	Rose	<i>Rosa species</i>	Shrub	S	4-5	4-5	3	2-3	2-3	
Rp ^{4/}	Western thimbleberry	<i>Rubus parviflorus</i>	Shrub	S	5	5	4	3-4	3-4	
Rpu ^{5/}	Cascara	<i>Rhamnus purshiana</i>	Shrub	S	5	4-5	4-5	3-4	3-4	
Rr ^{4/}	Sierra gooseberry	<i>Ribes roezlii</i>	Shrub	S, N	4-5	4	3	3	3-5	
Rru ^{4/}	Sierra coffeeberry	<i>Rhamnus rubra</i>	Shrub	S	5	4-5	3-5	3-4	3-4	
Rt	Squaw bush	<i>Rhus trilobata quinata</i>	Shrub	S	4	4-5	4	4	3-4	
Rx ^{4/}	Rubus species	<i>Rubus species</i>	Shrub	S	5	5	4	3-4	3-4	
S	Sugar pine	<i>Pinus lambertiana</i>	Tree	N	5	5	4-5	4-5	4-5	
Sal ^{5/}	Upright snowberry	<i>Symphoricarpos rivularis</i>	Shrub	U	4	3-4	3	2-3	3	
Scu ^{4/}	Spreading snowberry	<i>Symphoricarpos acutus</i>	Shrub	U	4	3-4	2-3	2-3	3-4	
Se ^{4/}	Blue elderberry	<i>Sambucus coerulea</i>	Shrub	S	3	3-4	2-3	2	1-2	
So	California storax	<i>Styrax officinalis californica</i>	Shrub	S	5	5	5	4-5	4-5	
Sso	Creeping sage	<i>Salvia sonomensis</i>	Shrub	S	4-5	5	4-5	4	3-4	
Sx	Willows	<i>Salix species</i>	S,T	S	5	4-5	3-4	3-4	2-3	
Sxe ^{4/}	Parish nightshade	<i>Solanum parishii</i>	H,S	U	--	--	--	--	--	
T	Tan oak	<i>Lithocarpus densiflora</i>	Tree	S	5	5	5	5	5	
Th ^{4/}	Tree of heaven	<i>Ailanthus altissima</i>	Tree	--	--	--	--	--	--	
U ^{5/}	Pacific yew	<i>Taxus brevifolia</i>	Tree	U	5	5	5	5	5	
Ui ^{3/}	--	--	--	--	--	--	--	--	--	
V	Valley oak	<i>Quercus lobata</i>	Tree	S	5	4	4-5	4-5	3-4	
Vc	California wild grape	<i>Vitis californica</i>	Shrub	S	4-5	4-5	3-4	3-4	3-4	
Vec ^{4/}	California false-hellebore	<i>Veratrum californicum</i>	Herb	U	5	4-5	4-5	5	5	
W	Interior live oak	<i>Quercus wislizenii</i>	Tree	S	5	4	3-5	3-4	3-4	

Table 3 (continued)

Map symbol	Common name	Scientific name	:Growth :habit	:Sprout ^{1/} :nature	Browse value ^{2/}				
					H	C	S	G	D
W	White fir	Abies concolor	Tree	N	5	4-5	4-5	3-4	3-4
Whm ^{h/}	Western whippell	Whippellia modesta	Shrub						
Xs	Nuttall willow	Salix scouleriana	Shrub	S	4	3	2-3	2-3	3
Y	Ponderosa pine	Pinus ponderosa	Tree	N	5	5	4-5	4-5	4-5

1/ Sprout nature:

S = Sprouts after fire.

N = Normally will not sprout if top is fire killed.

S,N = Sprouts after fire in some cases and is completely killed in others.

U = Post-fire sprouting capacity unknown.

Note: Some species though killed by fire, will stump sprout after cutting in the absence of fire.

2/ Browse value over-all ratings, including sprouts after burning or cutting:

1 = Very high

2 = High

3 = Medium

4 = Low

5 = Very low

Kind of animal:

H = Horses; C = Cattle; S = Sheep; G = Goats; D = Deer.

3/ Miscellaneous vegetation and landscape elements mapped are:

Symbol:

Ba Rock, bare, or litter-covered ground, essentially devoid of vegetation.

Cu Cultivated or fallow field, natural haylands, and irrigated pastures.

Gr Grasses and other associated herbaceous plants, includes meadows.

Hb Herbaceous plants that are bushy in size and character of growth.

Ma Wet meadow.

Mr Unidentified marshland herbs.

Ui Urban or industrial areas, frequently with no mappable soil due to industrial activity.

4/ Species not mapped but recorded on type-acre plots.5/ Species observed but not mapped or recorded on type-acre plots.6/ Species collected but not mapped or recorded on type-acre plots.7/ See reference--Gankin, R. 1966. A new species of *Arctostaphylos* from Glenn County, California.

Leaflet Western Botany 10:329-331.

8/ Includes the species and all its varieties.

Table 4.--Data on type-acre sampling plots

Plot No.	Location ^{1/}			Aspect & percent slope	Soil symbol ^{2/}	Cover class ^{3/}	Date sampled	Soft chess ^{4/}		Ground cover ^{5/}						Woody species with available browse ^{6/}
	T	R	S					Height	Stage	H	L	B	RG	I	W	
(in.) (percent)																
QUADRANGLE 24D-1																
1	33N	7W	13	SW-65	$\frac{872}{2S-3}$	2	22 Jul 64	-	-	(7/)	-	25	5	40	30	Af,Ap,Av,Cle,Rd,Cb,So
2	33N	7W	13	S-55	$\frac{872}{1S-3}$	4	22 Jul 64	8	D	5	-	65	10	-	20	Af,Ec
3	32N	7W	1	SW-50	$\frac{779}{2S-3}$	2	22 Jul 64	-	-	(7/)	(7/)	20	5	40	35	Af,Av,Pa,Ec,Rd,Qw,Cle,Li
4	33N	6W	22	NE-42	$\frac{7136V}{4S-2}$	1	21 Jul 64	-	-	(7/)	75	15	(7/)	5	5	D,Cn,B,I,Lde,Y,Scu,Qc
5	33N	6W	26	NE-30	$\frac{7136L}{3S-2}$	2	21 Jul 64	-	-	(7/)	5	15	(7/)	40	40	Qk,Ci,D,Y,Scu,Cn,Rct,Avc,B,Rd,Lde,M,Psu
6	33N	6W	26	S-65	$\frac{7136}{2R3-3}$	3	21 Jul 64	-	-	(7/)	5	35	40	10	10	Av,C,I,D,Y,S,So,Rru,Pa
7	33N	6W	35	W-70	$\frac{721}{2S-3}$	1	13 Jul 64	-	-	(7/)	10	45	(7/)	10	35	B,Av,C,Cb,Rd,D,Y,Aec,Pa,So,Rru,M
8	33N	6W	34	NE-55	$\frac{7136}{2S-3}$	1	22 Jul 64	-	-	(7/)	25	40	5	10	20	Av,C,B,Y,S,Lde,I,Rd,Cn,So,Aa,Ci
9	33N	6W	35	S-65	$\frac{721}{2R1-3}$	3	13 Jul 64	-	-	(7/)	(7/)	45	20	15	20	Pa,Av,C,Cb,Pl,Rct,Ci,Rd,Qw,Aec,Dp,So,Li,Rco,M
10	32N	6W	10	W-49	$\frac{721}{2E-2}$	3	22 Jul 64	-	-	15	10	45	(7/)	5	25	Av,B,Pa,Rd,C,So,Cle
11	32N	6W	13	SE-46	$\frac{721}{2RE-2}$	3	22 Jul 64	-	-	(7/)	15	50	10	5	20	Av,B,Aec,Sx,Pa,Cle
12	32N	6W	16	E-51	$\frac{775}{1S-3}$	2	22 Jul 64	-	-	(7/)	(7/)	30	5	35	30	Av,C,Pa,Rd,Dp,So,Ec,Cle
13	33N	6W	21	NW-60	$\frac{811}{3S-3}$	1	21 Jul 64	-	-	(7/)	(7/)	10	(7/)	60	30	B,Ci,Rd,D,Rr,M,Av,Scu,C,Ap,Cpo
14	33N	6W	28	NW-55	$\frac{872}{2S-3}$	1	21 Oct 66	-	-	(7/)	20	5	15	20	40	Qgb,Cb,Fd,Qk,Whm,Ci,Ap,Av,Qc,K,Rd,Li
15	33N	6W	14	SE-15	$\frac{7136V}{4-1}$	2	3 Apr 68	-	-	10	60	-	-	5	25	Cn,T,D,I,S,B,Y,Avc,Ap
QUADRANGLE 24D-2																
1	33N	8W	2	N-68	$\frac{820}{3S-3}$	1	29 Jul 64	-	-	(7/)	10	-	5	60	25	Cr,Lde,C,M,D,Xs,Rox,Scu
2	33N	8W	12	SW-60	$\frac{7125V2}{3-3}$	2	29 Jul 64	-	-	5	85	5	-	-	5	B,D,Cr,Scu,Lde,Ci,Rox,S,Y,Pe
3	33N	7W	16	W-55	$\frac{7125V2}{3-3}$	2	30 Jul 64	9	D	15	25	45	-	(7/)	15	Qgb,Qw,Cb,Rd,Cla,Ci,Aec
4	33N	8W	26	N-44	$\frac{815}{5-2}$	3	29 Jul 64	-	-	15	50	30	-	(7/)	5	D,Scu,B,C,Lde,Rr,Cr
5	33N	7W	29	SW-66	$\frac{837}{2S-3}$	3	29 Jul 64	10	D	5	(7/)	70	10	-	5	Cc,Af,Rd,Qw,D',Ec,Cec,Av,Sxg
6	33N	7W	31	S-55	$\frac{815}{5-3}$	3	24 Jul 64	12	D	15	35	45	-	-	5	Rt,Rd,Aec,D',Cec,Li,Ci,C,Sg,G
7	32N	7W	3	SE-32	$\frac{926}{5S-2}$	1	24 Jul 64	-	-	5	10	25	-	30	30	Av,C,Rt,Rd,Li,Cc,Pa,B,W,Cec,Cb,D',Th

Table 4 (continued)

Plot No.	Location ^{1/}			Aspect & percent slope	Soil symbol ^{2/}	Cover class ^{3/}	Date sampled	Soft chess ^{4/}		Ground cover ^{5/}					Woody species with available browse ^{6/}	
	T	R	S					Height	Stage	H	L	B	RG	I		W
(in.) (percent)																
QUADRANGLE 24D-2																
8	32N	7W	6	W-55	<u>7117</u> 5-3	2	24 Jul 64	-	-	5	20	65	-	(7/)	10	Rd,Cb,Ci,Cec,Af,B,Aec,C,Cle,Av,Qw,Ap,Psu,Scu,Li
9	32N	8W	11	NW-15	<u>716</u> 5-1	2	30 Jul 64	-	-	20	40	35	-	-	5	D,Y,B,Scu,S,C,Li,Rox
10	32N	8W	12	SE-80	<u>7129</u> 2-4	3	8 Jul 65	-	-	5	20	55	-	10	20	C,M,Y,B,Cle,Rd,Ci,S,D,Av
11	32N	8W	12	NE-32	<u>7158</u> 3-2	2	30 Jul 64	-	-	(7/)	85	10	-	(7/)	5	Rd,B,D,Y,C,S,Ci,Cr,Ate,Lde,Cn,Cle
12	32N	8W	13	NE-66	<u>7121</u> 2-3	1	28 Jul 64	-	-	(7/)	5	5	-	80	10	Lde,Cn,C,D,M,B,Cb,Rox,Rp,S,Rr,Scu
13	32N	7W	17	N-20	<u>716</u> 5-1	1	28 Jul 64	-	-	5	20	70	-	(7/)	5	Rd,Cle,D,B,Cec,C,Y,S,T,Ci
14	33N	7W	7	NE-65	<u>7125V2</u> 3-3	2	28 Apr 68	-	-	10	50	5	5	15	15	Qk,Cr,As,Rox,Scu,Ci,C,D,M,T,Y,B,Cn,Rp,Rd,Rr
QUADRANGLE 24D-3																
1	32N	8W	24	NE-15	<u>7121</u> 2-1	2	28 Jul 64	-	-	10	-	70	-	-	20	Cpj, Chb,Ap
2	32M	7W	30	N-6	<u>7121</u> 2-1	2	28 Jul 64	-	-	5	10	25	-	30	30	Lde,Cpj,Ap,I,D,S,Cn,W,Y,Rr,Ate
3	32N	7W	32	E-20	<u>7121</u> 5-1	2	28 Jul 64	-	-	10	10	75	-	(7/)	5	Lde,S,W,Cs,App,Led
4	31N	7W	29	S-15	<u>716</u> 5-1	2	23 Jul 64	-	-	(7/)	15	50	-	10	25	Av,Am,Cle,Rd,Y,B,D,C,Ci
5	31N	7W	28	N-25	<u>7129</u> 5-1	2	29 Jul 64	-	-	(7/)	5	20	-	35	40	Av,Cle,Rd,Rox,Ci,Am,Ec,B,Y,C
6	31N	7W	30	NE-34	<u>7117</u> 5-2	2	23 Jul 64	-	-	10	20	55	-	(7/)	15	Av,Am,Cle,C,S,Y,B,Rd,Rox,Ci,Cn
7	31N	7W	33	S-16	<u>757</u> 2E-1	2	29 Jul 64	-	-	(7/)	-	20	-	30	50	Af,Ap,Av,Cle,Qw,Ef,B,Qgb,Rd
8	31N	7W	29	W-25	<u>7117</u> 2E-1	2	23 Jul 64	-	-	(7/)	10	20	-	35	40	Cle,B,Av,Ap,Qgb,C,Y,Rox,Ec
9	31N	7W	30	NE-55	<u>7129</u> 3-3	3	2 Jul 60	-	-	5	70	5	-	10	10	Rd,C,B,D,M
10	31N	7W	31	SW-33	<u>7129</u> 3E2-2	2	23 Jul 64	-	-	10	5	25	-	15	40	Av,Am,Cle,Y,I,M,Rd,D,Ci,Rox,B,C
QUADRANGLE 24D-4																
1	31N	6W	32	S-8	<u>757</u> 4-C	3	3 May 72	20	F	20	59	16	-	-	5	Am,D',Av,Rd,W,Li,V,Sg,Cc,Dp
2	32N	6W	23	W-40	<u>721</u> 2-2	2	27 Jul 64	-	-	(7/)	5	20	10	40	25	Av,Pa,So,B,C,Rd,Cle,Ci
3	32N	6W	27	SW-30	<u>775</u> 2S-2	1	27 Jul 64	-	-	(7/)	30	30	5	10	25	Av,Rd,Cle,B,So,Ec,C,Y,Qw,Pa,Li,Px
4	32N	6W	21	W-35	<u>781</u> 2S-2	1	27 Jul 64	-	-	(7/)	5	15	10	50	20	Av,Qgb,Qw,So,Rd,Dp,Af,Pa,Ec,Cec,Rci,Li,Scu
5	32N	6W	28	NE-23	<u>7118</u> 4-1	2	25 Jun 64	-	-	5	60	10	-	(7/)	25	Av,Pa,Rd,B,Rox,Y,Qc,D,Cle,S

Table 4 (continued)

Plot No.	Location ^{1/}			Aspect & percent slope	Soil symbol ^{2/}	Cover class ^{3/}	Date sampled	Soft chess ^{4/}		Ground cover ^{5/}						Woody species with available browse ^{6/}
	T	R	S					Height	Stage	H	L	B	RG	I	W	
(in.)									----- (percent) -----							
QUADRANGLE 24D-4																
6	32N	6W	29	NW-60	<u>728</u> 2S-3	2	27 Jul 64	-	-	5	35	25	-	15	20	B,C,Av,Rd,D,Y,Cn,Lde,Rox, Cle,K,S,Rru
7	31N	6W	2	SW-50	<u>721</u> 2S-3	3	20 Apr 72	-	-	5	10	55	15	-	15	Pa,Av,Rd,Cle,W,So,B,Dp, Li,Rct,Cb,Aec

^{1/} Plots shown on the map by circled numbers in the Township (T), Range (R), and Section (S) indicated.

^{2/} Soil series and phases, see Tables 1 and 2 for key. Detailed soil profile descriptions for these sites are on file at the Pacific Southwest Forest and Range Exp. Sta., Berkeley.

^{3/} Area covered by crowns of all woody plants:

Symbol	Cover Class	Ground Covered (Percent)
1	Dense	> 80
2	Semidense	50-80
3	Open	20-50
4	Very Open	5-20
5	Extremely Open	< 5

^{4/} Mean maximum height and stage of maturity of soft chess (Bromus mollis):

V = Vegetative stage (plant not yet flowering)
 F = Flowering stage (plant has seed stalk and is still green)
 D = Dry stage (plant is dead)

^{5/} Ground space covered or occupied by these vegetation and landscape units below a reference plane 4.5 feet above the ground:

H = Herbage--all herbaceous plant material of the current growing season.
 L = Litter--dead plant material on the ground exclusive of heavy woody material.
 B = Bare soil--particles less than 2 mm.
 RG = Rock and gravel--surface coarse fragments greater than 2 mm and bedrock.
 I = Inaccessible--space that grazing animals physically cannot occupy owing to presence of tree stems, logging debris, tall and dense brush, and other obstructions.
 W = Woody vegetation available for browsing--small twigs and foliage of all woody plants regardless of palatability less than 4.5 feet tall and accessible to grazing animals.

Browse species are listed in last column of this table. Herbaceous and all woody species are listed in Table 5.

^{6/} Listed in decreasing order of abundance. See Table 3 for key to species symbols and browse values.

^{7/} Unit is present but too scarce to measure (usually less than 5 percent).

Table 5.—Plant species on type-acre sampling plots ^{1/}

		7.5-minute quadrangle numbers			
		24D-1	24D-2	24D-3	24D-4
Scientific name	Common name	Plot numbers where found			
<u>ANNUAL GRASSES:</u>					
<i>Aira caryophyllea</i>	Silver hairgrass	10,11,12.	6,7,9,10,13.	4,5,6,8,10.	1,2,3,4,7.
<i>Avena barbata</i>	Slender wild oats		3,5,6,8.		1,3.
<i>Avena fatua</i>	Common wild oats				1.
<i>Briza minor</i>	Little quakinggrass				3.
<i>Bromus carinatus</i>	California brome	13.	6,8,9,10,13.	9,10.	
<i>Bromus commutatus</i>	Hairy chess				1.
<i>Bromus madritensis</i>	Spanish brome		7.		1,4,7.
<i>Bromus mollis</i>	Soft chess	2.	3,5,6.		1,4.
<i>Bromus racemosus</i>	Smooth soft chess		6.		1.
<i>Bromus rigidus</i>	Ripgut		3,5,6,8.	9,10.	1.
<i>Bromus rubens</i>	Red brome	2,9.	5,7.	7.	7.
<i>Bromus tectorum</i>	Cheatgrass, Downy brome	2.	3,5,7,9,10,12.	1.	
<i>Cynosurus echinatus</i>	Annual dogtail				1.
<i>Festuca</i> spp.	Annual fescue	14.		9.	
<i>Festuca bromoides</i>	European foxtail fescue	2.	5.	5.	1,4.
<i>Festuca confusa</i>	Confusing fescue		10.		
<i>Festuca megalura</i>	Foxtail fescue		13.	5.	1, 7.
<i>Festuca microstachys</i>	Pubescent reflex fescue	9.	8,13.	4,6.	3.
<i>Festuca myuros</i>	False foxtail fescue	1,2,7,9,10,11,12,13.	3,5,6,7,8,13.	4,5,6,7,8,10.	2,3,4,5.
<i>Festuca pacifica</i>	Pacific fescue		6.	6,10.	7.
<i>Festuca reflexa</i>	Reflex fescue	7,12.	3,9,10.		3.
<i>Gastridium ventricosum</i>	Nitgrass	2,9.	7,13.	4,10.	3,4.
<i>Hordeum leporinum</i>	Foxtail, mouse barley				1.
<i>Lolium multiflorum</i>	Italian ryegrass				1.
<u>PERENNIAL GRASSES AND GRASS-LIKE PLANTS:</u>					
<i>Agropyron parishii laeve</i>	Parish wheatgrass		6,10.		
<i>Agropyron spicatum</i>	Bluebunch wheatgrass		9.		
<i>Agrostis diegoensis</i>	Leafy redtop	7.			
<i>Agrostis exarata</i>	Spike redtop	10.		6,10.	3,5,6.
<i>Bromus laevipes</i>	Woodland brome		3,8,13.		5.
<i>Bromus orcuttianus</i>	Orcutt brome	4,13.	12.	1,2,3.	
<i>Carex</i> spp.	Sedge	5,6,14.	4.	1,2,3.	
<i>Carex multicaulis</i>	Many-stem sedge	4,5,7,13.	2,9,10,11,14.	2,5,9.	5.
<i>Elymus glaucus glaucus</i>	Blue wild rye		2,4,6,7,8,9.	5,6,9,10.	
<i>Elymus glaucus jepsonii</i>	Jepson wild rye	4,13.			
<i>Festuca californica</i>	California fescue	4,5,8.	2,4,9,12,13.		
<i>Festuca occidentalis</i>	Western fescue	7.	4,9,11,12,13,14.	9.	5.
<i>Luzula comosa</i>	Common wood rush		10.		
<i>Luzula subsessilis</i>	Foothill wood rush	10.	4,8,9,13.	4,6.	1,5,6.
<i>Melica aristata</i>	Awed melic		10,11,12.	2.	
<i>Melica geyeri</i>	Geyer oniongrass		4.		
<i>Melica harfordii</i>	Harford melic		8,13.		
<i>Poa pratensis</i>	Kentucky bluegrass	13.			1.
<i>Poa scabrella</i>	Pine bluegrass	7.	3,6,7,8,9,10,11,13.	9.	
<i>Sitanion hystrix californicum</i>	Squirreltail	9,13.	5,7.	1,2,4.	4,5.
<i>Stipa californica</i>	California stipa			1,2.	
<i>Stipa lemmonii</i>	Lemmon stipa	7,13.	5,6,13.	4,6,8,10.	3,5.
<i>Stipa stillmanii</i>	Stillman stipa			2,3.	
<i>Trisetum cernuum canescens</i>	Tall trisetum	4.	11.		

Table 5 (continued)

		7.5-minute quadrangle numbers			
		24D-1	24D-2	24D-3	24D-4
Scientific name	Common name	Plot numbers where found			
ANNUAL FORBS:					
Allophyllum divaricatum		2.			
Calycadenia truncata scabrella		9.	6.		
Centaurea melitensis	Napa star thistle	2.	5.		
Centaurea solstitialis	Yellow star thistle				1.
Cerastium viscosum	Mouse-ear chickweed		3.		1.
Cirsium pastoris	Snowy thistle		8,10.		
Cirsium proteanum	Venus thistle	2.	5.		
Clarkia sp.	Farewell-to-spring				1.
Clarkia rhomboidea	Forest clarkia		3,10,11.		7.
Collomia sp.	Collomia		7.		
Crucianella angustifolia	Crucianella		6.		
Cryptantha sp.	Cryptantha		8,10.	1.	
Daucus pusillus	Rattlesnake weed		3,5,6.		1,4,7.
Epilobium minutum	Slender annual fireweed	1,7.	7,10,12.		
Eriogonum vimineum	Wicker buckwheat	2.	10.		
Erodium cicutarium	Red-stem filaree		6.		
Erodium obtusiplicatum	Foothill Filaree		5.		
Euphorbia spathulata	Spurge		6.		
Evax acaulis					7.
Filago gallica	Filago	2,9,11,12.		4,7.	1,2.
Galium aparine	Goosegrass		4,9,10,12.		1.
Galium divaricatum	Lamarck bedstraw		6.		
Galium parisiense	Wall bedstraw				1.
Gayophytum diffusum diffusum	Gayophytum		12.	1,2,3.	
Geranium dissectum	Common wild geranium				1.
Gilia capitata pedemontana	Blue field gilia	9.	10.	1.	
Githopsis specularioides	Common blue-cup		10.		
Hypochoeris glabra	Smooth catsear				7.
Lactuca serriola	Prickly lettuce				1.
Lessingia nemaclada		9.	5,6,8.		
Linanthus bicolor	Linanthus		6.		1.
Linanthus ciliatus	Whisker linanthus		5.	1.	
Lotus micranthus	Small-flower lotus		3,5,7,10.	4.	1,2,7.
Lotus purshianus	Spanish clover	1,11,12.			
Lotus subpinnatus	Calf lotus		7,8.	10.	7.
Lupinus sp.	Annual Lupine		5.		
Lupinus bicolor microphyllus	Bicolor annual lupine				1.
Lupinus vallicola apricus	Foothill lupine				7.
Madia elegans	Common madia		10.		
Madia exigua	Little tarweed		3,6,10.	8,10.	
Madia gracilis	Gumweed madia	2.	2,3,5,6,8, 9,10,13.	1,10.	
Medicago hispida	Bur medic, bur clover				1.
Micropus californicus	Micropus		5.		1.
Microsteris gracilis	Microsteris		2,4,10.		
Montia perfoliata	Miners lettuce		2,3,12.	10.	1.
Moss and moss-like plants		1,3,9,10.	1,8,12.	5,7,8,10.	1,2,3,6,7.
Nemophila pedunculata	Meadow nemophila				1.
Plagiobothrys sp.	Popcorn flower				7.
Silene gallica	Windmill pink		5.		
Sisymbrium officinale	Hedge mustard				1.
Stellaria media	Common checkweed				1.
Stephanomeria virgata	Tall stephanomeria	2.	3,5,6.		
Streptanthus tortuosus		6.			
Thysanocarpus curvipes elegans	Lace pod				7.
Torillis arvensis	Field hedge parsley				1.

Table 5 (continued)

		7.5-minute quadrangle numbers			
		24D-1	24D-2	24D-3	24D-4
Scientific name	Common name	Plot numbers where found			
ANNUAL FORBS: (continued)					
<i>Torilis nodosa</i>	Knotted hedge parsley				1.
<i>Trifolium bifidum</i>	Pinole clover		6.		
<i>Trifolium ciliolatum</i>	Tree clover		5,6.		1.
<i>Trifolium dubium</i>	Shamrock clover				1.
<i>Trifolium hirtum</i>	Rose clover		3.		1.
<i>Trifolium microcephalum</i>	Maiden clover		5,6.		1,7.
<i>Trifolium olivaceum columbinum</i>	Dove clover		5.		
<i>Trifolium tridentatum</i>	Tomcat clover				7.
<i>Tunica prolifera</i>	Tunica				1.
<i>Vicia angustifolia</i>	Common vetch				1.
PERENNIAL FORBS:					
<i>Achillea borealis californica</i>	Common yarrow				5.
<i>Achillea lanulosa lanulosa</i>	Mountain yarrow		2,6,7,8,9, 10,13.	9.	
<i>Adenocaulon bicolor</i>	Trail plant		4,14.		
<i>Agoseris grandiflora</i>	Grand mountain dandelion		3,6,8,9.		3.
<i>Agoseris retrorsa</i>	Spear-leaf mountain dandelion			6.	
<i>Allium</i> sp.	Onion		3.		
<i>Apocynum pumilum</i>	Mountain hemp	4,5,8,10.	9,10,13.	2,4,8.	5,6.
<i>Aquilegia formosa</i>	Columbine		14.		
<i>Aralia californica</i>			12.		
<i>Arnica discoidea radiata</i>			1,4.		
<i>Arnica venosa</i>					6.
<i>Asarum hartwegii</i>	Hartweg wild ginger	4.	1,14.		
<i>Asclepias cordifolia</i>	Purple milkweed		10.		
<i>Aster oregonensis</i>		11.			
<i>Balsamorhiza hirtella</i>	Deltoid balsamroot		10.		
<i>Brodiaea</i> spp.	Brodiaea	10.	4.	8.	6.
<i>Brodiaea congesta</i>	Ookow		8.		
<i>Brodiaea ida-mala</i>	Firecracker flower		6.	9.	
<i>Brodiaea lutea analina</i>	Golden brodiaea			6,9.	
<i>Brodiaea pulchella</i>	Wild-hyacinth		6.		1,5.
<i>Calochortus</i> spp.	Mariposa Lily		2.	6,10.	
<i>Calochortus tolmiei</i>	Tolmie star-tulip				7.
<i>Calystegia polymorpha</i>	Modoc morning-glory	4,7.	2,8,9,13.		3,5,6.
<i>Campanula prenanthoides</i>	California harebell	4,5.	4,11,12,14.		6.
<i>Castilleja</i> sp.	Paint brush				6.
<i>Chlorogalum pomeridianum</i>	Soap plant			6,10.	7.
<i>Comandra umbellata californica</i>	Bastard toad-flax	8.	2.		2,6.
<i>Cynoglossum grande</i>	Western houndstongue		2,4.		
<i>Cynoglossum occidentale</i>	Houndstongue				6.
<i>Delphinium</i> sp.	Larkspur		2,3.		
<i>Dentaria</i> sp.			4.		
<i>Disporum hookeri trachyandrum</i>	Sierra fairy bells		4.		
<i>Dodecatheon</i> sp.	Shooting stars		2,4.	9.	6,7.
<i>Erigeron inornatus</i>	California rayless daisy		8,10.		
<i>Eriogonum nudum pubiflorum</i>		13.	5,10.	1.	1,7.
<i>Eriogonum umbellatum</i>					
<i>umbellatum</i>	Sulfur buckwheat			1.	
<i>Eriophyllum lanatum</i>					
<i>grandiflorum</i>	Common Woolly-sunflower	9.	5,8,10.	10.	3,4,7.
<i>Erythronium</i> sp.		4.			
<i>Frasera albicaulis nitida</i>	Shining fraseria	5,8,10.	9,13.	2,4,8.	6.
<i>Fritillaria</i> sp.	Fritillary		2.		
<i>Galium</i> sp.		14.	14.		
<i>Galium bolanderi</i>	Bolander galium		2,10,11,13.	4,6.	3,4,5,6.
<i>Galium nuttallii tenue</i>	Climbing galium	5,9,10,12.	3,5,6,7,8,10.	5,9,10.	2,3,7.
<i>Gnaphalium</i> sp.	Everlasting	2,12.	9,13.		7.
<i>Habenaria elegans</i>				6.	

Table 5 (continued)

Shasta and Trinity Counties, French Gulch Quadrangle, 24D-1,2,3,4

		7.5-minute quadrangle numbers			
		24D-1	24D-2	24D-3	24D-4
Scientific name	Common name	Plot numbers where found			
PERENNIAL FORBS: (continued)					
<i>Helianthella californica nevadensis</i>	Sierra helianthella	5,8,10,12.	2,4,9,11.	4,6,8.	5,6.
<i>Hieracium albiflorum</i>	White-flower hawkweed	6,7,8.	2,4,9,12,14.	6,10.	5,6.
<i>Horkelia tridentata</i>	Three-tooth horkelia				3.
<i>Hypericum concinnum</i>	Goldwire	7,9,10,11,12.		4,5,6,8.	2,3,4,5,6.
<i>Hypericum perforatum</i>	Klamath weed		7.	10.	1,3,5.
<i>Iris hartwegii</i>	Iris	4.			
<i>Iris tenuissima</i>	Iris	4,5,6,8,10,15.	2,4,9,10,11,12,13,14.	1,2,3,5,6,9,10.	6.
<i>Iris tenuissima purdyiformis</i>	Iris	7.			5.
<i>Kelloggia galioides</i>	Kelloggia			1,2.	
<i>Lathyrus sulphureus</i>	Sulfur pea	2,4,8,9,10,13.	4,6.		
<i>Lithospermum californicum</i>	Shasta puccoon				5,6.
<i>Lomatium utriculatum</i>	Common lomatium		8.		
<i>Lotus crassifolius</i>	Big deervetch		9,10.	2,3.	
<i>Lupinus</i> spp.	Lupine	5,7,15.	2,4,9.	1,4,10.	6.
<i>Lupinus andersonii</i>	Anderson lupine			3.	
<i>Lupinus latifolius</i>	Lupine		3,5.		
<i>Marah</i> sp.	Wild cucumber	14.	6,8.		
<i>Monardella odoratissima</i>	Mountain monardella	9.	13.	4,6,10.	
<i>Monardella villosa sheltonii</i>	Monardella		10.		6.
<i>Onychium densum</i>	Cliff-brake				7.
<i>Osmorhiza chilensis</i>	Mountain sweet-cicely	4,7.	2,4,8,9,11,13,14.	9.	5,6.
<i>Pedicularis densiflora</i>	Indian warrior	8,15.	2,9.		6.
<i>Pellaea mucronata</i>	Birdsfoot fern	9,12.			
<i>Perideridia</i> sp.			9.		
<i>Phacelia</i> sp.	Phacelia	2.	5.	1.	
<i>Pityrogramma triangularis</i>	Goldenback fern				3,7.
<i>Polygala cornuta</i>	Sierra milkwort	5,10.	11,14.	2.	2.
<i>Polystichum munitum</i>	Sword fern	6,7,13.	1,14.		6.
<i>Potentilla glandulosa</i>	Common cinquefoil		8.		
<i>Pteridium aquilinum pubescens</i>	Bracken fern	4,7,8,15.	2,4,9,10,11,14.	2,4,5,6,9.	5,6.
<i>Pyrola picta picta</i>	White-vein shinleaf	15.			
<i>Ranunculus occidentalis eisenii</i>	Western buttercup		6.	10.	1.
<i>Rumex acetosella</i>	Sheep-sorrel				1.
<i>Salvia sonomensis</i>	Creeping sage	1,3.			4.
<i>Sanicula bipinnatifida</i>	Purple Sanicle		6,8,9,10.	9,10.	4,5.
<i>Senecio aronicoides</i>	California groundsel		12.		
<i>Silene californica</i>	Calif. scarlet campion	7.	11.		6.
<i>Smilacina racemosa amplexicaulis</i>	Fat solomon		1,4,12,14.		
<i>Thermopsis gracilis</i>	Slender false-lupine	15.	2,4.		
<i>Trientalis latifolia</i>	Star flower	5,15.	1,12,14.		2,5,6.
<i>Veratrum californicum</i>	Western false hellebore		4,14.		
<i>Vicia americana oregana</i>	American vetch			4.	
<i>Vicia californica</i>	California vetch		2,4,6,9,14.	5,6.	
<i>Viola</i> spp.	Violet	15.	2.	5.	3.
<i>Viola lobata lobata</i>	Pine violet	4.	14.		
<i>Viola lobata integrifolia</i>	Pine violet	4.			
<i>Viola purpurea</i>	Mountain violet		10.		
<i>Viola sheltonii</i>	Shelton violet		12.		
<i>Wyethia angustifolia</i>	Narrow-leaf mule ears	10.	5,11.	4.	6.
<i>Zigadenus fremontii</i>	Star-lily				7.
TREES AND SHRUBS:					
<i>Abies concolor</i>	White fir			2,3.	

Table 5 (continued)

		7.5-minute quadrangle numbers			
		24D-1	24D-2	24D-3	24D-4
Scientific name	Common name	Plot numbers where found			
TREES AND SHRUBS: (continued)					
<i>Acer macrophyllum</i>	Bigleaf maple	5,7,9,13.	1,10,12,14.	9.	
<i>Adenostoma fasciculatum</i>	Chamise	1,2,3.	5,8.	7.	4.
<i>Aesculus californica</i>	Shrub californica buckeye	7,9,11.	3,6,8.		7.
<i>Ailanthus altissima</i>	Tree of heaven		7.		
<i>Alnus rhombifolia</i>	White alder	(3/)	(3/)	(3/)	(3/)
<i>Alnus tenuifolia</i>	Mountain alder		11.	2.	
<i>Amelanchier pallida</i>	Western serviceberry	8.	14.		
<i>Arbutus menziesii</i>	Madrone			10.	
<i>Arctostaphylos canescens</i> x <i>viscida</i>	Balaklala manzanita	5,15.			
<i>Arctostaphylos manzanita</i> manzanita	Common manzanita			4,5,6,10.	1.
<i>Arctostaphylos manzanita</i> wieslanderii	Shingletown manzanita	(4/)			
<i>Arctostaphylos nevadensis</i>	Pinemat manzanita			(3/)	
<i>Arctostaphylos patula patula</i>	Greenleaf manzanita	1,13,14,15.	8.	1,2,7,8.	
<i>Arctostaphylos patula</i> platyphylla	Pine manzanita			3.	
<i>Arctostaphylos roofii</i>	Roof manzanita		(5/)		
<i>Arctostaphylos viscida</i>	Whiteleaf manzanita	1,3,6,7,8, 9,10,11,12, 13,14.	5,7,8,10.	4,5,6,7,8,10.	1,2,3,4,5,6,7.
<i>Calocedrus decurrens</i>	Incense-cedar	4,6,8,15.		1,2,3,10.	
<i>Calycanthus occidentalis</i>	Spice-bush		(4/)		(4/)
<i>Ceanothus cordulatus</i>	Mountain whitethorn			(3/)	
<i>Ceanothus cuneatus</i>	Wedgeleaf ceanothus		5,7.		1.
<i>Ceanothus integerrimus</i> ^{2/}	Deerbrush	5,8,9,13,14.	2,3,6,8,10, 11,13,14.	4,5,6,10.	2.
<i>Ceanothus lemmonii</i>	Lemmon ceanothus	1,3,10,11,12.	8,10,11,13.	4,5,6,7,8,10.	2,3,5,6,7.
<i>Ceanothus prostratus laxus</i>	Upright squaw carpet			1,2.	
<i>Ceanothus prostratus</i> prostratus	Squaw carpet	13.			
<i>Cercis occidentalis</i>	California redbud		5,6,7,8,13.		4.
<i>Cercocarpus betuloides</i>	Birchleaf mountain mahogany	1,7,9,14.	3,7,8.		7.
<i>Chrysolepis sempervirens</i>	Bush chinquapin			3.	
<i>Clematis lasiantha</i>	Pipe-stem clematis		3.		
<i>Cornus nuttallii</i>	Pacific dogwood	4,5,8,15.	11,12,14.	2,6.	6.
<i>Cornus sessilis</i>	Miners dogwood				(4/)
<i>Corylus cornuta californica</i>	California hazelnut		1,2,4,11,12,14.		
<i>Cupressus macnabiana</i>	Macnab cypress	(4/)			
<i>Dendromecon rigida</i>	Bush poppy		(3/)		
<i>Eriodictyon californicum</i>	California yerba santa	2,3,12.	5.	5,7,8.	3,4.
<i>Fraxinus dipetala</i>	Foothill ash	14.			
<i>Fraxinus latifolia</i>	Oregon ash	(3/)			
<i>Garrya fremontii</i>	Fremont silktassel	(3/)	(3/)		
<i>Haplopappus bloomeri</i>	Bloomer goldenbush			1.	
<i>Heteromeles arbutifolia</i>	Toyon, christmas berry	3,6,7,9,10, 11,12.	7.		2,3,4,5,7.
<i>Leucothoe davisiae</i>	Sierra-laurel			3.	
<i>Lithocarpus densiflora</i> densiflora	Tan-oak	15.	13,14.		
<i>Lithocarpus densiflora</i> echinoides	Shrub tan-oak	4,5,8.	1,2,4,11,12.	2,3.	6.
<i>Lonicera interrupta</i>	Chaparral honeysuckle	3,9,14.	6,7,8,9.		1,3,4,7.
<i>Penstemon breviflorus</i> glabrisepalus	Penstemon				3.
<i>Philadelphus lewisii</i> californicus	California mock orange	9.			
<i>Physocarpus capitatus</i>	Pacific nine bark	(5/)	(4/)		
<i>Pinus attenuata</i>	Knobcone pine	5,6,8,11,14.	7.		3,6,7.
<i>Pinus lambertiana</i>	Sugar pine	4,6,8,13,15.	2,9,10,11,12, 13.	2,3,6.	5,6.
<i>Pinus ponderosa</i>	Ponderosa pine	4,5,6,7,8, 11,13,15.	2,4,6,7,8,9, 10,11,13,14.	1,2,3,4,5,6, 8,9,10.	3,5,6,7.

Table 5 (continued)

		7.5-minute quadrangle numbers			
		24D-1	24D-2	24D-3	24D-4
Scientific name	Common name	Plot numbers where found			
<u>TREES AND SHRUBS:</u> (continued)					
<i>Pinus sabiniana</i>	Digger Pine	9,12.	3,5,7,8.		1,2,4,7.
<i>Prunus emarginata</i>	Bitter cherry		2.		
<i>Prunus subcordata</i>	Sierra plum	5.	8.		
<i>Pseudotsuga menziesii</i>	Douglas-fir	4,5,6,7,8, 13,15.	1,2,4,8,9,10, 11,12,13,14.	2,4,9,10	5,6.
<i>Quercus chrysolepis</i> <i>chrysolepis</i>	Canyon live oak	6,7,8,9,10,	1,4,6,7,8,9, 12,13.	4,5,6,8,9,10, 10,11,12,13,14.	2,3,6.
<i>Quercus chrysolepis nana</i>	Shrub canyon live oak	4,14.			5.
<i>Quercus douglasii</i>	Blue oak		5,6,7.		1.
<i>Quercus durata</i>	Leather oak			(3/)	
<i>Quercus garryana breweri</i>	Brewer oak	14.	3.	7,8.	4.
<i>Quercus garryana garryana</i>	Oregon oak, garry oak		6.		
<i>Quercus kelloggii cibata</i>	Shrub Calif. black oak	5,14.	14.		
<i>Quercus kelloggii kelloggii</i>	California black oak	4,5,7,8,10, 11,13,15.	2,4,6,7,8,9, 10,11,12,13,14.	4,5,6,7,8,9, 10.	2,3,5,6,7.
<i>Quercus lobata</i>	Valley oak				1.
<i>Quercus morehus</i>	Oracle oak	(4/)			
<i>Quercus vaccinifolia</i>	Huckleberry oak			(3/)	
<i>Quercus wislizenii</i> <i>frutescens</i>	Shrub interior live oak	3,9.	3,5,8.	7.	3,4.
<i>Quercus wislizenii</i> <i>wislizenii</i>	Interior live oak		7.		1,7.
<i>Rhamnus californica</i> <i>crassifolia</i>	Thick-leaf coffeeberry			(3/)	
<i>Rhamnus californica</i> <i>tomentella</i>	Chaparral coffeeberry	5,9.			7.
<i>Rhamnus crocea illicifolia</i>	Hollyleaf redberry				4.
<i>Rhamnus purshiana</i>	Cascara sagrada	(4/)			
<i>Rhamnus rubra obtusissima</i>	Sierra coffeeberry	9.			
<i>Rhamnus rubra rubra</i>	Sierra coffeeberry	6,7.			6.
<i>Rhododendron occidentale</i>	Western azalea				(4/)
<i>Rhus diversiloba</i>	Poison-oak	1,3,5,7,8,9, 10,12,13,14.	3,5,6,7,8,10, 11,13,14.	4,5,6,7,9,10.	1,2,3,4,5,6,7.
<i>Rhus trilobata quinata</i>	Common squaw bush		6,7.		
<i>Ribes roezlii</i>	Sierra gooseberry	13.	4,12,14.	2.	
<i>Rosa sp.</i>	Rose		1,2,9,12,14.	5,6,8,10.	5,6.
<i>Rubus spp.</i>	Blackberry	(4/)			
<i>Rubus leucodermis</i>	Western raspberry	(4/)	(4/)		(4/)
<i>Rubus parviflorus</i>	Western thimbleberry		12,14.		
<i>Salix sp.</i>	Willow	11.			
<i>Salix scouleriana</i>	Nuttall willow		1.		
<i>Sambucus caerulea</i>	Mountain blue elderberry		6.		1.
<i>Solanum parishii</i>	Parish nightshade		5.		
<i>Styrax officinalis</i> <i>californica</i>	California storax	1,6,7,8,9,10, 12.			2,3,4,7.
<i>Symphoricarpos acutus</i>	Spreading snowberry	4,5,13.	1,2,4,8,9,12, 14.		4.
<i>Symphoricarpos rivularis</i>	Snowberry				(4/)
<i>Taxus brevifolia</i>	Pacific Yew			(4/)	(4/)
<i>Vitis californica</i>	California wild grape				(3/)
<i>Whipplea modesta</i>	Whipplea	14.			

1/ More data on percent composition and abundance of plants are on file at the Department of Agronomy and Range Science, University of California, Davis.

2/ Varieties not differentiated.

3/ Mapped in quadrangle indicated but not recorded on plots.

4/ Observed in quadrangle indicated but not recorded on plots.

5/ Collected in quadrangle indicated but not recorded on plots.

Table 6--Five orders of soils in the French
Gulch Quadrangle, by series, family, and subgroup

Series	Family	Subgroup
Entisols		
Exchequer	Loamy, mixed, nonacid, thermic	Lithic Xerorthents
Corbett	Mixed, frigid	Typic Xeropsamments
Inceptisols		
Kidd	Medial, mesic <u>1</u> /	Lithic Vitrandepts
Modesty	Coarse-loamy, mixed, thermic	Typic Xerochrepts
Tish Tang		
Variant 2	Fine-loamy, mixed, mesic	Dystric Xerochrepts
Neuns	Loamy-skeletal, mixed, mesic	Dystric Xerochrepts
Chawanakee	Loamy, mixed, mesic, shallow	Dystric Xerochrepts
Chaix	Coarse-loamy, mixed, mesic	Dystric Xerochrepts
Kanaka	Coarse-loamy, mixed, thermic	Dystric Xerochrepts
Sheetiron	Loamy-skeletal, micaceous, mesic	Dystric Xerochrepts
Maymen	Loamy, mixed, mesic	Dystric Lithic Xerochrepts
Goulding	Loamy-skeletal, mixed, mesic	Lithic Xerochrepts
Millsholm	Loamy, mixed, thermic	Lithic Xerochrepts
Huse	Clayey, mixed, mesic	Lithic Xerochrepts
Auburn	Loamy, mixed, thermic	Ruptic-Lithic Xerochrepts
Mollisols		
Los Gatos	Fine-loamy, mixed, mesic	Typic Argixerolls
Fiddletown		
Variant	Fine-loamy, mixed, mesic	Pachic Ultic Argixerolls
Henneke	Clayey-skeletal, serpentinitic, thermic	Lithic Argixerolls
San Andreas	Coarse-loamy, mixed, thermic	Typic Haploxerolls
Tollhouse	Loamy, mixed, mesic, shallow	Entic Haploxerolls
Alfisols		
Redding	Fine, kaolinitic, thermic	Abruptic Durixeralfs
Greenfield	Coarse-loamy, mixed, thermic	Typic Haploxeralfs
Stonyford	Loamy, mixed, thermic	Lithic Mollic Haploxeralfs
Dubakella	Clayey-skeletal, serpentinitic, mesic	Mollic Haploxeralfs
Sobranite	Fine-loamy, mixed, thermic	Mollic Haploxeralfs
Behemotosh	Loamy-skeletal, mixed, mesic	Ultic Haploxeralfs
Marpa	Loamy-skeletal, mixed, mesic	Ultic Haploxeralfs
Boomer	Fine-loamy, mixed, mesic	Ultic Haploxeralfs
Holland	Fine-loamy, mixed, mesic	Ultic Haploxeralfs
Hotaw	Fine-loamy, mixed, mesic	Ultic Haploxeralfs
Musick	Fine-loamy, mixed, mesic	Ultic Haploxeralfs
Auberry	Fine-loamy, mixed, thermic	Ultic Haploxeralfs
Sierra	Fine-loamy, mixed, thermic	Ultic Haploxeralfs
Hoda	Fine, kaolinitic, mesic	Ultic Haploxeralfs
Newtown	Fine, montmorillonitic, thermic	Ultic Haploxeralfs
Newville	Fine, montmorillonitic, thermic	Mollic Palixeralfs
Ultisols		
Horseshoe	Fine-loamy, mixed, mesic	Xeric Haplohumults
Sites	Clayey, kaolinitic mesic	Xeric Haplohumults
Diamond		
Springs	Fine-loamy, mixed, mesic <u>1</u> /	Typic Haploxerults
Behemotosh		
Variant	Fine-loamy, mixed, mesic	Typic Haploxerults
Josephine	Fine-loamy, mixed, mesic	Typic Haploxerults

1/ Mapped as "thermic" in French Gulch Quadrangle.

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SOIL-VEGETATION SURVEY

COOPERATING AGENCIES
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DIVISION OF FORESTRY—DEPARTMENT OF CONSERVATION—
THE RESOURCES AGENCY—STATE OF CALIFORNIA
TO TRINITY CENTER

SOIL-VEGETATION MAP

Ben F. Smith, Earl B. Alexander and James I. Mallory

SOIL SERIES AND PHASES
COVER PERCENT CLASSES OF WOODY VEGETATION
SPECIES COMPOSITION OF DOMINANT VEGETATION
SITE QUALITY OF TIMBER CROPLANDS
SOIL-VEGETATION PLOT LOCATIONS
EJG 12-81

24D-1

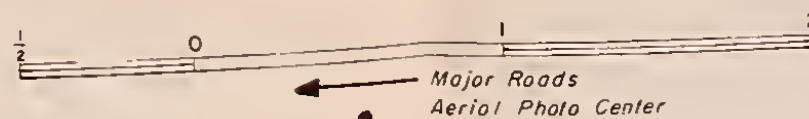
FRENCH GULCH
QUADRANGLE
(Northeast Quarter)
SHASTA COUNTY
CALIFORNIA



Accompanies report SOILS and VEGETATION of the
FRENCH GULCH QUADRANGLE—(24D-1,2,3,4)
Shasta and Trinity Counties, California.

Classification and mapping, 1962 to 1964 & 1968.
Map compilation by J. Klingensmith, 1963.
Edition of December 1973.

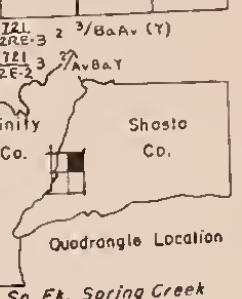
Scale: 1"=31680'



Base map: N.E. 1/4 U.S.G.S. French Gulch Quadrangle,
15' series. Edition of 1957. Mt. Diabla Meridian.
Land grid compiled from U.S.F.S., N.P.S., and C.D.F.
source maps. No final accuracy claimed.
Aerial photography: BUY 1952, EJG 1961, SC 1962.
Soil names subject to final correlation.

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24D-2	24D-1	23C-2
24D-3	24D-4	23C-3





SOIL-VEGETATION SURVEY
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DIVISION OF FORESTRY — DEPARTMENT OF CONSERVATION
THE RESOURCES AGENCY — STATE OF CALIFORNIA

SOIL SERIES AND PHASES
COVER PERCENT CLASSES OF WOODY VEGETATION
SPECIES COMPOSITION OF DOMINANT VEGETATION
SITE QUALITY OF TIMBER CROPLANDS
SOIL-VEGETATION PLOT LOCATIONS

Chester O. Stane, James M. Crawford and James L. Mallory

TO KENO CAMP



Scale : 1:31680

Base map: N.W. $\frac{1}{4}$ U.S.G.S. French Gulch Quadrangle,
15' series. Edition of 1957. M1, Ojibla Meridian.
Land grid compiled from U.S.F.S., N.P.S. and C.D.F.
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Aerial photography: BU Y 1952, E J G 1961, SC 1962. *Soilnames subject to final correlation.*

Edition of December 1973

SOIL-VEGETATION SURVEY

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 THE RESOURCES AGENCY—STATE OF CALIFORNIA

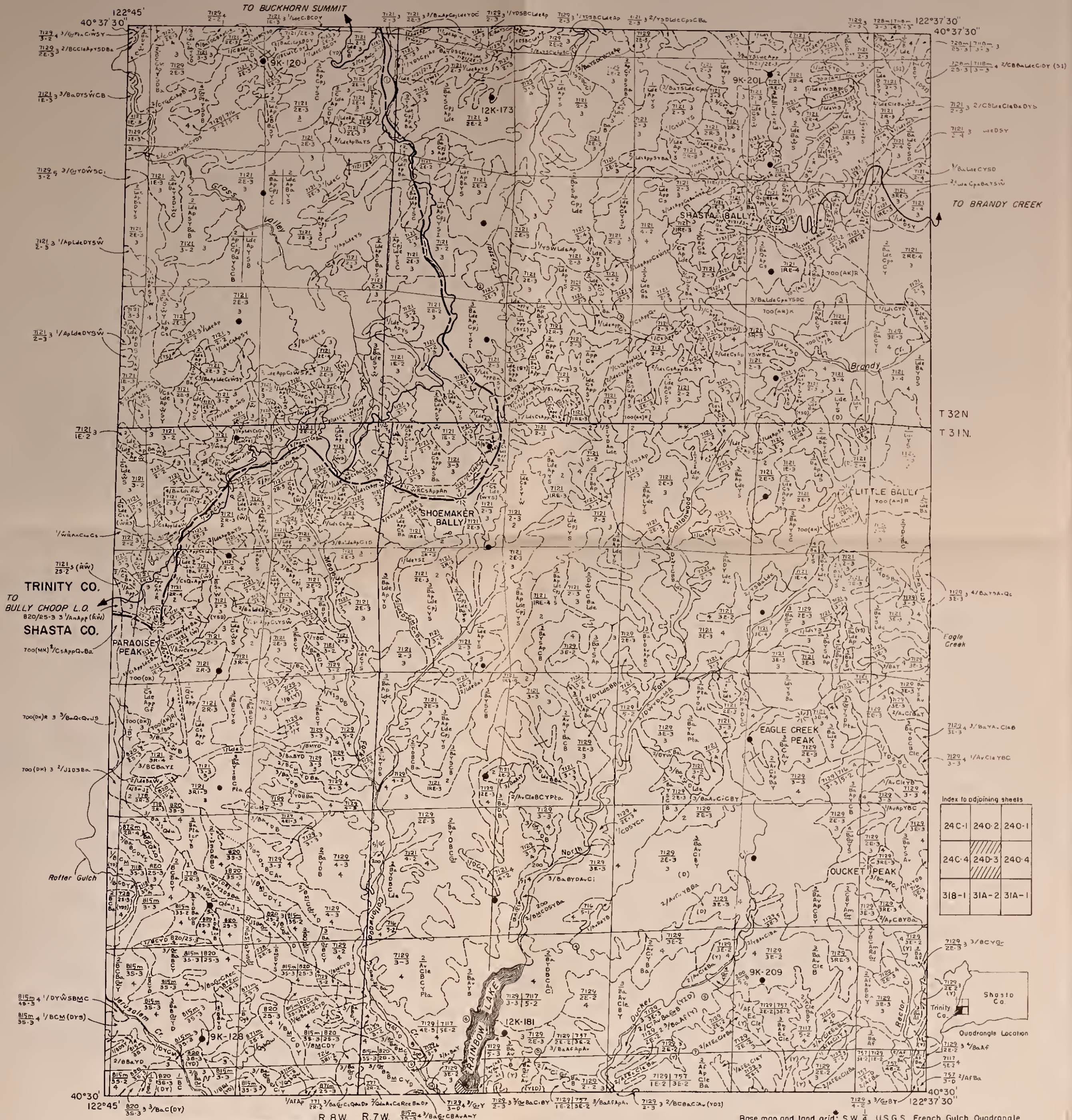
SOIL-VEGETATION MAP

By

James M. Crawford, Chester O. Stone and James I. Mallory

SOIL SERIES AND PHASES
 COVER PERCENT CLASSES OF WOODY VEGETATION
 SPECIES COMPOSITION OF DOMINANT VEGETATION
 SITE QUALITY OF TIMBER CROPLANDS
 SOIL-VEGETATION PLOT LOCATIONS

FRENCH GULCH
 QUADRANGLE
 (Southwest Quarter)
 SHASTA COUNTY
 and
 TRINITY COUNTY
 CALIFORNIA



Index to adjoining sheets

24C-1	24D-2	24D-1
24C-4	24D-3	24D-4
31B-1	31A-2	31A-1

Accompanies report: SOILS and VEGETATION of the
 FRENCH GULCH QUADRANGLE—(24D-1, 2, 3, 4),
 Shasta and Trinity Counties, California.

Scale 1:31680

2 Miles

Classification and mapping, 1961 to 1964 & 1968. Map
 compilation by O. Johnson, 1962; J. Klingensmith, 1966. Edition of December 1973.

Major Roads
 Aerial Photo Center

Base map and land grid: S.W. 4 U.S.G.S. French Gulch Quadrangle,
 15" series. Edition at 1957. M. Diabla Meridian.

Aerial photography: BUY 1952.

*Land grid compiled from U.S.F.S., N.P.S., and C.O.F. source
 maps. No final accuracy claimed.

Soil names subject to final correlation.

SOIL-VEGETATION MAP

COOPERATING AGENCIES:
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SOIL-VEGETATION MAP

by
James I. Mallory and Theodore A. Klaseen

SOIL SERIES AND PHASES
COVER PERCENT CLASSES OF WOODY VEGETATION
SPECIES COMPOSITION OF DOMINANT VEGETATION
SITE QUALITY OF TIMBER CROPLANDS
SOIL-VEGETATION PLOT LOCATIONS

24D-4

FRENCH GULCH
QUADRANGLE
(Southeast Quarter)
SHASTA COUNTY
CALIFORNIA



T. 32 N.
T. 31 N.
TO SHASTA

350 2/A/Qw/QwPa
28-3
701 2/A/Qw/QwPa
28-3
718 3
25-3 3/A/Qw/B(Y)
2/A/Qw/Ca/Ba

241 2/A/Pa/Qw/Dp
2-3
241 2-3 1/A/Pa/Qw/Dp
4/A/G/Ba/Dp
759 2/A/Kd/WB/Dp
2-2
8322 759 2/A/Bd/WB/Dp
26-2 25-2
8322 721 3
25-3 25-3
779 2-3 1/Qw/Qw/Cle
748 2/A/Bd/WB/Dp
3-2

Index to adjoining sheets

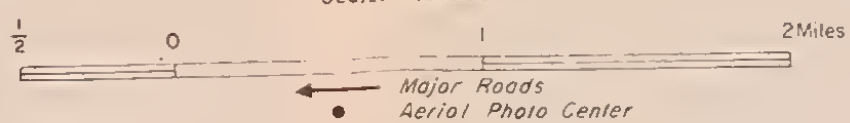
24D-2	24D-1	25C-2
24D-3	24D-4	23C-3
31A-2	31A-1	32B-2

TO REDDING

8379 2/WB/Dp/A/G
29-3
700 (DP) 1/A/Cd/WB/Dp
Trinity Co. Shasta Co.
Quadrangle Location
700 (A) 1/A/G/Ba/Dp/Da
759 4/A/WB/A/Cd
24-0 1/A/G/Ba/Dp/Da
759 3/3R-0 3/A/D/VDP

122°37'30" 40°30' 122°37'30" 40°30' R. 7W. R. 6W.
Accompanies report: SOILS and VEGETATION of the
FRENCH GULCH QUADRANGLE — (24D-1,2,3,4)
Shasta and Trinity Counties, California.
Classification and mapping, 1962 to 1964 & 1968
Map compilation by J. Klingensmith, 1963.
Edition of December 1973.

Scale: 1:31680



Base map: N.E. 1/4 U.S.G.S. French Gulch Quadrangle,
15' series. Edition of 1957. Mt. Diablo Meridian.
Land grid compiled from U.S.F.S., N.P.S. and C.D.F.
source maps. No final accuracy claimed.
Aerial photography: BUY 1952, E.J.G. 1961, SC 1962.

Soil names subject to final correlation.

Mallory, James L., Wilmer L. Colwell, Jr., and W. Robert Powell.

1973. Soils and vegetation of the French Gulch quadrangle (24-D,1,2,3,4) Trinity and Shasta Counties, California. Pacific Southwest Forest and Range Exp. Stn., Berkeley, Calif. 42 p., illus. (USDA Forest Serv. Resour. Bull. PSW-12)

This bulletin summarizes results of a soil-vegetation survey of 145,000 acres comprising the French Gulch quadrangle in Trinity and Shasta Counties, in northern California. The data supplement maps of the area. Described are the survey area, soil-vegetation associations, timber site quality, new soils and plants, and explanatory legends that accompany the maps. The report was issued in cooperation with the California Division of Forestry and the University of California Division of Agricultural Sciences.

Oxford: 182.58(794) + 114.7(794).

Retrieval Terms: soil surveys; vegetation surveys; French Gulch quadrangle; Klamath Mountains; Trinity County; Shasta County; California.

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